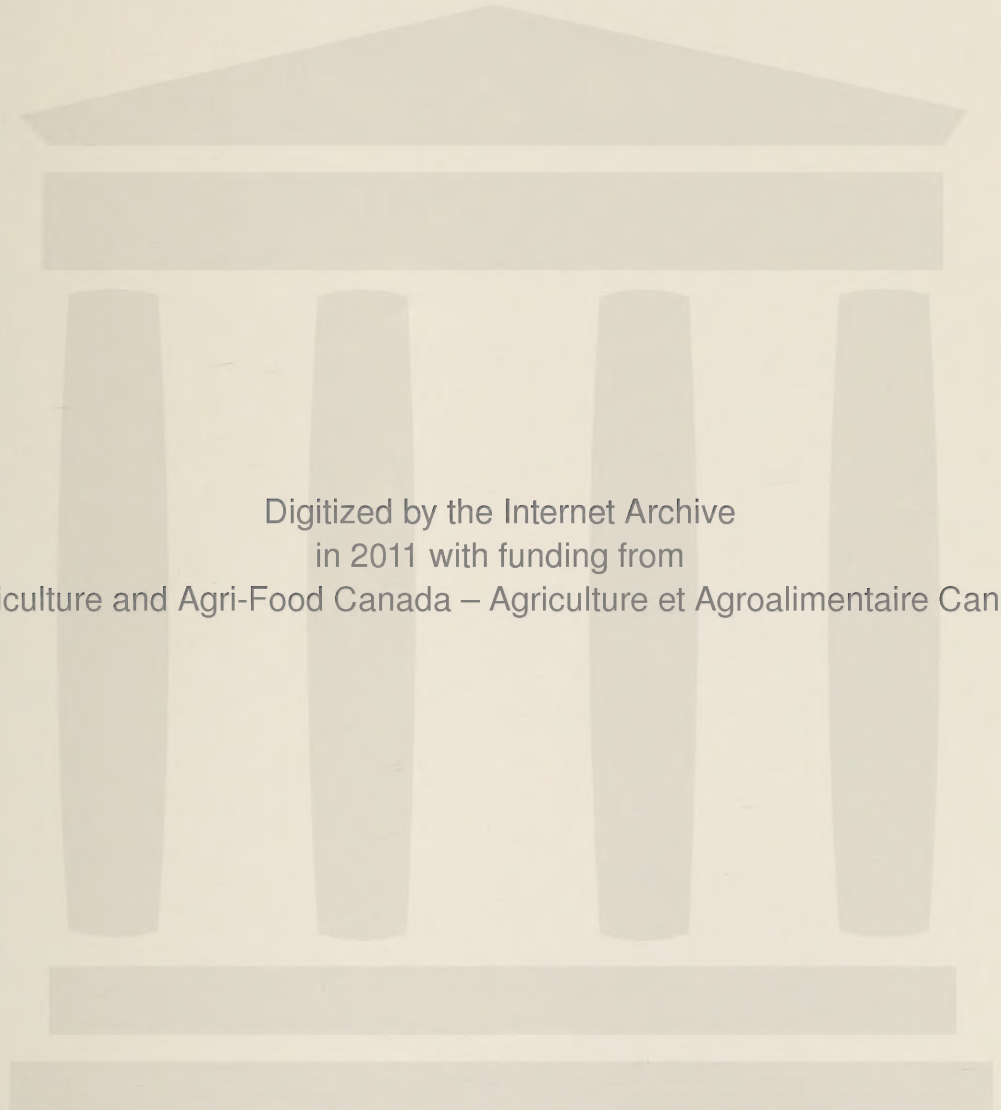


FLORA OF THE QUEEN CHARLOTTE ISLANDS
PART 1

JAMES A. CALDER
ROY L. TAYLOR

The FLORA OF THE QUEEN CHARLOTTE ISLANDS describes for the first time the vegetation of the home of the Haidas. It is being published in three parts, of which this is the first. The Queen Charlotte Islands are the northernmost remnants of a now almost completely submerged coastal mountain chain. James A. Calder and Roy L. Taylor, the authors of this volume, spent two summers in this far western outpost of Canada gathering data and specimens. In spite of the physical difficulties of the terrain and of traveling on the Islands, they quadrupled the known flora. Furthermore, they realized an ambition that few Canadian botanists have achieved: the discovery of a distinctive group of endemic species and a filmy fern previously unknown to North America. Part 1 of the *Flora* provides a systematic treatment and distribution maps of the 594 taxa found on the Islands. It also includes a botanical history of the Islands, and a discussion of their physiography, geology, climate, economic botany, plant communities and phytogeography. Part 2 will treat the cytological aspects of the vascular plants of the Islands and Part 3 the systematics and phytogeography of the non-vascular plants found there. The three-volume work is written for the professional botanist, but naturalists and specialists in related areas will also find in it many topics of interest.

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Looking east along the wooden plank road that runs just behind the stabilized sand dunes between Masset and Tow Hill.

FLORA
OF THE
QUEEN CHARLOTTE ISLANDS
PART 1 SYSTEMATICS OF THE VASCULAR PLANTS

JAMES A. CALDER
and ROY L. TAYLOR

PLANT RESEARCH INSTITUTE
CENTRAL EXPERIMENTAL FARM
OTTAWA, ONTARIO



1968
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FOREWORD

A botanical investigation of the Queen Charlotte Islands was a natural outgrowth of the energetic exploration of the northern Cordillera begun by James A. Calder when he worked in the western Yukon in 1949 and the Kenai Peninsula of Alaska in 1951. Study of his collections made clear to him our inadequate knowledge of the distribution and relationships of the plants of British Columbia. He and I accordingly began a systematic coverage of British Columbia in 1953. It was clear from the start that the Queen Charlottes must be included in the general survey, but attention was prematurely focussed on the Islands during our studies of *Saxifraga:* a scrap of *Saxifraga taylori* lurking among borrowed sheets of *S. vespertina* was clearly an unnamed species; and the variation in *S. punctata* on the adjacent mainland told us that there had to be a distinct population in the Islands. (In retrospect, I can think of few more rewarding moments than when we found our first stand of *S. punctata* ssp. *carlottae* on Tan Mountain and saw that it had the characters that we had specified.) The attack on the Islands was accordingly advanced to the summer of 1957, partly to allow prompt completion of two *Saxifraga* studies and partly, perhaps, from the hope that, if two novelties had been found, there would be others. Our optimism was soon justified.

After 1957 several circumstances prevented me from keeping in close touch with the progress of these studies. When I read the complete manuscript of this volume I was thus able to view it with more detachment, but certainly no less interest, than a continuous involvement would have allowed.

The study proved more complex than at first expected. When Roy L. Taylor, who had accompanied the 1957 party as a seasonal field assistant, joined the staff of the Institute he saw the desirability of securing as complete cytological data as possible. Although a start was made by growing plants from 1957 seed, an adequate study demanded a return to the Islands. By delaying the return until taxonomic work was largely completed the authors were able to fill many gaps. More attention was paid to adventives in 1964 than in 1957, when we attempted to get complete coverage of the flora and ample duplicates. (Some measure of our labors in 1957 may be given by our consumption of over 12,000 sheets of precut newsprint.) Vouchers for the cytological collections account, incidentally, for the substantial duplication in 1964 of 1957 collection sites.

The taxonomic difficulties that delayed completing this work lie not, of course, in the endemics and pronounced disjuncts but in the many species that are widespread on the adjacent mainland. Those who have collected on both sides of the British Columbia Coast Range are aware that the coastal and interior populations of many species are slightly distinct, or sometimes statistically distinct but with certain individuals indistinguishable. Again, in some species whose coastal populations are separable in British Columbia, we find a most confusing situation south of the Cordilleran ice sheet in Oregon. Thus almost all

species in the flora of the Islands had to be considered in relation to their total range, and each taxonomic decision based on the study of a long series of extralimital specimens—often amounting to well over a hundred sheets.

The authors have presented a factual biogeographic account, which is perhaps proper to a *Flora;* but, in view of the interest that some of the botanical findings have already aroused among biogeographers and glacial geologists, some disappointment may be felt that a more detailed discussion is not given. I hope that eventually all the zoological and botanical evidence concerning endemism in the Islands will be collated and related to Pleistocene and Recent physical geography. The evidence for a Wisconsin refugium, probably at low elevation on the west coast and partly below contemporary sea level, is supported by considerably more evidence than that of the widely disjunct or endemic vascular plants. In addition to several races of birds and mammals whose age is problematic, there is, for example, a very distinctive amphipod, *Paramoera carlottensis* Bousfield, described from west-coast spray pools. The bryophytes will be discussed by Dr. W. B. Schofield in the third volume of this series.

Even in the inadequately studied parasitic fungi we have one markedly disjunct species (*Exobasidium empetri* Ito et Otani) and a sharply distinct endemic subspecies (*Puccinia pimpinellae* (Str.) Röhl. ssp. *carlottae* Savile). These fungi indicate that both *Empetrum* and *Osmorhiza* (presumably the somewhat montane *O. purpurea*) persisted on the Islands. Without the mycological evidence we would have had no indication that *Osmorhiza purpurea* survived, and we must be prepared to believe that other forest species may have done so without appreciable morphological change. Forest trees, in scrub form, may have sheltered the forest herbs, but we should scarcely expect appreciable changes in such ancient and genetically stable species as the conifers in a mere 50,000 years or so.

The endemics and disjuncts on the Islands are emphatically not xerophytic alpines such as might persist on windswept mountain peaks protruding as nunataks. Indeed the Islands can hardly be said to maintain or support a high-alpine flora even today. Although several of the relicts do push above tree line, some are confined to lowland rain forest near the west coast (e.g. *Mecodium wrightii*), others descend almost to sea level on the west coast (e.g. *Isopyrum savilei*), and all grow in moderately to very wet situations where they are exposed to fog and rain or the drip from cliffs or forest canopy. The refugium thus seems to have been at low elevation and with an oceanic climate. Geologists have disparaged the existence of a refugium, save for ecologically impossible alpine nunataks; but the biological evidence seems almost incontrovertible. It is difficult to assert reliably that all of the heavily vegetated west coast was glaciated; but, even if it was, we need not assume that it was all glaciated simultaneously. If the ice cover was in the form of lobes rather than a continuous sheet, a change in the precipitation pattern, due to a shift in the mean position of the Aleutian Low, could induce accretion of one lobe and oblation of another. This is essentially what is happening to the Barnes Icecap in Baffin Island today, where accretion and oblation nearly balance at the southeast end but oblation greatly exceeds accretion at the northwest end; and, if accretion were slightly higher in the southeast part, we should have a cap of constant size moving bodily southeastward.

The reader will see that several species are represented on the Islands by two or even three subspecies. These cases of essentially sympatric subspecies are not necessarily examples of unrealistic taxonomy, but probably no single explanation will cover all cases. In *Saxifraga punctata* it is clear that ssp. *carlottae* is an endemic, and it has been suggested that ssp. *cascadensis* moved north along the British Columbia coast early in the last deglaciation and reached the Islands before the shallows of Hecate Strait were covered. A similar explanation may hold for several species; but for others there may have been two or more post-glacial invasions as climatic fluctuations caused subspecies to move north or south on the mainland. Some invasions surely occurred after the rising sea inundated the shallows east of Sandspit. Probably an appreciable number of late immigrants arrived through the agency of wind, birds and rafting. Aquatics such as *Potamogeton* are easily carried by ducks. Plumed seeds and fruits, very small seeds (e.g. Orchidaceae), and small loose-coated seeds (e.g. *Juncus* and *Leptarrhena*), must occasionally blow distances greater than the width of Hecate Strait. Rafting is depreciated by some botanists, but must occasionally operate in this region, where an easterly gale and a spring tide may throw logs high on shore. It is significant that the only record of *Vaccinium scoparium* for the Islands is from a drift log.

The total picture of the invasion of the Islands is not clear, but the occurrence of two or more races of a species gives us an impression of marked movement by the mainland flora. The situation is reminiscent of the east flank of the Washington Cascades where several subspecies (isolated from their main range) may occur a few miles apart without appreciable intergradation, perhaps because their gene pools are too limited to allow them to spread over new habitats. The analogous situation in some of the Queen Charlotte populations may warrant study.

Mr. James Calder, whose vigorous and well-planned botanical exploration of the Pacific Northwest has added greatly to our comprehension of the glacial and biological history of the region, has, to the profound regret of his colleagues, decided upon a change of vocation. Even if he should never return to botanical studies this volume will be far from his final contribution to North American botany. Future generations of botanists will continue to be grateful for the abundant, precisely documented and beautifully prepared specimens of his collecting that they will find in many institutions. Just as they have helped the critical evaluation of many species in the Queen Charlotte Islands, so will these specimens continue to serve in the dynamic study of the region embraced by the Cordilleran ice sheet: the tracing of Wisconsin refugia, of pockets that escaped the last Wisconsin substage, and of thinly covered corridors that quickly became ice-free; the rates and routes of migration of plants that reoccupied the deglaciated land; and the fluctuations of species limits that resulted from post-glacial climatic changes.

D. B. O. Savile

Plant Research Institute
Ottawa, Ontario, 1967

PREFACE

Our interest in the flora of the Pacific Northwest goes back to the late 1940's, when members of the Plant Research Institute and Entomology Research Institute of the Canada Department of Agriculture conducted surveys of biting flies in the Yukon and Alaska under the auspices of the Defence Research Board of the Department of National Defence.

At the time of these surveys the lack of adequate comparative material was a serious handicap. As a consequence, it was decided that a field investigation would be started in British Columbia and the Yukon after the Defence Research Board project had been completed. The initial survey was carried out in southern British Columbia by J. A. Calder and D. B. O. Savile in the summer of 1953, and on this basis Mr. Calder planned a phytogeographic treatment of the flora of the Cordilleran region of Western Canada. Although it was fully realized that it would not be possible to solve many of the taxonomic problems in the region, studies of a few genera enabled us to delimit and interpret the distribution patterns of their taxa. During the course of a study of the genus *Saxifraga* sect. *Trachyphyllum* (Calder and Savile, 1959*b*), a fragmentary collection of what appeared to be a new saxifrage from the Queen Charlotte Islands was examined. The possible presence of a new species coupled with the already known endemic *Senecio newcombei* strongly suggested that an important refugium from at least late Wisconsin time, before the last major ice withdrawal, existed in these Islands. Such a refugium had already been postulated by zoologists on the basis of a few endemic species and subspecies of mammals and birds. A perusal of the literature and an examination of the few herbaria rich in British Columbia material clearly indicated that the Islands were little known botanically and for these reasons we altered our British Columbia field program in order to conduct a full-scale survey of the Islands in the summer of 1957.

It is 101 years since the first recorded plant collections were made on the Queen Charlotte Islands. In 1866 Robert Brown, on a brief trading voyage to Moresby Island, collected a few mosses and lichens. In the ensuing years many biologists and other professional scientists visited the Islands, but as far as we can ascertain no one attempted to make a systematic study of the vegetation. Prior to 1957 the only extensive collecting was done by Dr. C. F. Newcombe, who visited the Charlottes many times between 1895 and 1923. His collections are of importance as they contain the endemic *Senecio newcombei* and a number of other significant records, but they are of limited value because most were made in the immediate vicinity of the coastal settlements and now-abandoned Haida village sites.

The results of the initial survey that we and Dr. Savile made in 1957 were beyond our fondest hopes and expectations. The fragmentary collection of the *Saxifraga* found by Spreadborough at Canoe Pass in 1910 was clearly established as a new species on the basis of a number of collections. *Senecio*

newcombei was found to be one of the dominant subalpine—alpine elements of the mountainous regions. About ten new taxa were added to the list of endemics, and a number of species disjunct from their main ranges were located. Towards the end of the 1957 survey it became apparent that to complete a study of the flora a second summer had to be spent on the Islands. Seven years elapsed, however, before our return to the Charlottes in 1964. In the intervening years the systematic treatment of the flora had been prepared and with this in hand we were in a better position to analyze the vegetation of the Islands.

We are fortunate to have had available two outstanding floras for regions that border the area of our study. The 10-volume *Flora of Alaska and Yukon* by Eric Hultén has been a constant source of reference. Doctors C. Leo Hitchcock, Arthur Cronquist, Marion Ownbey and J. W. Thompson have almost completed a 5-volume series, *Vascular Plants of the Pacific Northwest*, and this well-documented work of high calibre has also been constantly referred to. As might be expected, our taxonomic treatment is at times at variance with these floras, but this in no way minimizes the importance of these works. It is safe to say that we would not have attempted to write a flora of the Queen Charlotte Islands if floras of such a high standard had not been available. Too many floras are mere compilations with keys, descriptions and references essentially copied from earlier works and containing all their inherent errors. This is certainly not the case with the two floras mentioned. They are outstanding contributions to our knowledge of the vegetation of the Pacific Northwest.

Our botanical investigations and those of our colleagues are being presented in three volumes, of which this is the first. The second volume, which deals with the cytological aspects of the vascular flora, is being prepared by R. L. Taylor and G. A. Mulligan, and the third volume, which deals with the bryoflora, is being undertaken by W. B. Schofield. The task of putting our information into print has been long and arduous, but it has not been without many satisfactions. We are pleased that another link in the chain of plant studies of the Cordilleran region of North America can be added, for surely the study of the ever-evolving world of plants is one of the most fascinating aspects of biology today.

JAMES A. CALDER
ROY L. TAYLOR

ACKNOWLEDGMENTS

The planning, development and completion of any research project is always beset with pitfalls and blind alleys. Problems become magnified when the area of study is an inhospitable group of islands some 2,500 miles from the home office. However, we have been fortunate in having many friends and colleagues who made our task much easier through their thoughtfulness and generous donation of time and equipment. We would like to express our appreciation to these people.

The actual surveys were greatly facilitated by the presence of colleagues from various botanical disciplines. During the 1957 survey we were fortunate to have Dr. D. B. O. Savile of the Mycology Unit of our institute with us for most of the summer and Dr. Hermann Persson, a bryologist of the Palaeobotanical Department of the Swedish Museum of Natural History, Stockholm, Sweden, for about one month. In 1964 we were privileged to have Dr. Antero Vaarma, Director of the Botanical Institute of the University of Turku, Finland, and Dr. W. B. Schofield of the University of British Columbia, Vancouver, with us for varying periods of time.

We are grateful to Dr. T. M. C. Taylor of the University of British Columbia at Vancouver, Dr. A. F. Szczawinski of the British Columbia Provincial Museum at Victoria, and Dr. A. E. Porsild of the National Museum of Canada, for the loan of collections from the Queen Charlotte Islands from their respective herbaria. Dr. Szczawinski provided an especially helpful service in having the recently acquired Newcombe collection mounted so that it might be more readily utilized.

We are indebted to many people who have contributed to the systematic treatment of the flora by their identification of particular groups: Dr. W. G. Dore (Gramineae), Dr. Th. Sørenson (*Puccinellia*), Dr. W. M. Bowden (*Elymus*), Dr. M. Raymond (*Eriophorum*), Dr. T. Koyama (*Scirpus*, *Agrostis*), Dr. G. W. Argus (*Salix*), Dr. C. Frankton (*Polygonum*, *Rumex*, *Cirsium* and many other introduced species), Dr. J. R. Swanson (*Montia*), Mr. G. A. Mulligan (Cruciferae and many other introduced species), Dr. P. H. Raven (Onagraceae), Dr. L. Constance (Umbelliferae), Dr. R. Alava (*Conioselinum*), Dr. H. J. Thompson (*Dodecatheon*), Dr. F. Hommersand (*Amsinckia*) and Mr. L. C. Sherk (cultivated plants). The helpful and patient untangling of nomenclatural problems by Dr. J. M. Gillett is much appreciated.

Doctors C. J. Heusser, R. W. Pillsbury, W. G. Ziller and C. J. Guiget kindly supplied much useful survey information prior to our visit to the Islands in 1957. Mr. P. Henson, former Indian Agent at Masset, was helpful in many ways. We would like to thank Dr. A. Sutherland Brown of the British Columbia Department of Mines and Petroleum Resources for the use of kodachromes and for stimulating discussions concerning glaciation on the Charlottes. Dr. E. Mills, a summer student in 1957 with the National Museum of Canada, and Dr. R. L.

Schmidt of the Forest Research Division of the British Columbia Forest Service kindly donated collections to the Plant Research Institute for citation in the *Flora*. We would also like to thank Dr. J. B. Foster and his assistants who at our request made a number of important collections during a two-summer zoological survey of the Islands. During the course of the two summer surveys, accommodation and transportation were kindly made available, in their respective forest areas, by Rayonier Canada Ltd. at Moresby Logging Camp at the head of Cumshewa Inlet, and by MacMillan, Bloedel and Powell River Ltd. at Juskatla Logging Camp, Masset Inlet. The British Columbia Forest Service of the Department of Lands, Forests and Water Revenues was helpful in providing space for equipment in the summer of 1957. The success of our surveys along the coasts of the Islands is in great measure due to the kind cooperation of the federal Fisheries Department and of their fishery officers at Masset, Queen Charlotte City and Sandspit. There are, of course, many other people who contributed in a variety of ways to our survey on a day-to-day basis. We would particularly like to thank the crews of the vessels of the Fisheries Department and the various crew members of the *Biltmore* for their help in making our coastal trips so successful.

The preparation of this volume was made a much easier task by the continued interest and helpful suggestions of Dr. C. Frankton and Mr. R. A. Hamilton, who spent many hours in reading the original manuscript. We are also grateful to our colleagues in the Taxonomy Unit of the Plant Research Institute who provided opinions on the many proposals that had to be made in the preparation of the *Flora*.

We would like to thank Mr. G. D. V. Williams of the Agrometeorology Section of the Plant Research Institute, who contributed the section on the climate of the Queen Charlotte Islands.

The photographs, maps, graphs and charts were prepared by the bio-Graphic Unit of the Scientific Information Section of the Research Branch. Mrs. Marion Platek prepared the drawings of new and noteworthy taxa and Miss J. Horton assisted in the final preparation of index and glossary. Finally, special thanks is extended to the Institute administrative staff for their help in arranging travel details and to the stenographic pool for their cheerful perseverance in typing the manuscript.

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Botanical History

The discovery of the Queen Charlotte Islands (Figure 1) dates back to July 17, 1774, when Juan Perez, under the orders of the Viceroy of New Spain, sailed northward along the Pacific coast in his ship the *Santiago* with orders to claim all land in the name of Spain. In the years immediately following, fur-trading ships of many nations visited the Islands for pelts of the sea otter, which abounded in this region. As far as we are aware, none of the early explorers or traders made any attempt to study the local vegetation.

The first collected specimens for which we have records were made by Robert Brown during the course of a trading voyage to Moresby Island in 1866. The specimens were apparently confined to mosses and hepatics. It was not until 1878, when G. M. Dawson explored the east and north coasts of the Islands for the Geological Survey of Canada, that the first vascular plants were collected. Although Dawson's report was mainly concerned with a description of the geology, topography and geographic features, it included botanical observations and a list of the plant species obtained. Since 1878, a number of small collections have been made by visiting biologists, but these collections have contributed little to our knowledge of the vascular flora. The only significant surveys, other than Dawson's, were those of Dr. C. F. Newcombe, who collected extensively on his many trips to the Charlottes between 1895 and 1923, and those of members of the Plant Research Institute, who spent five months on the Islands in the summers of 1957 and 1964.

The following list of collectors is presented chronologically by the date of the first collection.

1878. George M. Dawson with a crew of four on the schooner *Wanderer* surveyed the Queen Charlotte Islands during the summer of 1878 for the Geological Survey of Canada. He left Victoria on May 27 and proceeded northward, reaching the Houston Stewart Channel near the southern tip of the Charlottes on June 12. He briefly surveyed the east coast of Moresby Island and a number of the offshore islands. At Skidegate Inlet the party diverted to the west to explore Skidegate Channel to the western end of the narrows. Upon their return they again headed northward and followed the east and north coasts of Graham Island to Masset. The period from August 10 to 19 was spent in surveying Masset Inlet. On returning to Masset Dawson proceeded along the north coast to Parry Passage and Langara Island, stopping en route to explore Virago Sound and Naden Harbour. On August 27 the western end of Parry Passage was navigated and Dawson reported seeing Frederick Island to the south. The party then returned to Dixon Entrance and made their way to the mainland coast. During the course of the exploration of the north and east coasts 76 vascular taxa were



Figure 1 The Queen Charlotte Islands and their place names.

collected. The specimens were identified by Prof. John Macoun and the list of plants was published as an appendix to Dawson's report. This important collection is in the National Museum at Ottawa. There is a set of 54 numbers in the McGill University herbarium that appear to be duplicates but are labeled in the handwriting of Rankin Dawson who accompanied his brother on the survey of the Charlottes. It is unfortunate that so many of the Dawson collections are labeled merely Queen Charlotte Islands.

1883. James G. Swan was sent by the United States Fish Commission, National Museum, and Bureau of Ethnology to make collections of biological specimens on the Queen Charlotte Islands during the summer of 1883. During his stay on the Charlottes he lived with Alexander McKenzie of the Hudsons' Bay Company at Masset, and his collections were made in this general region. Swan (1885) reported the collecting of 24 vascular plant taxa, all observed in the vicinity of Masset and along the north shore of Graham Island. His collections are now in the United States National Museum at Washington.

1888-1897. Franz Boas, an outstanding anthropologist and linguist, visited the Queen Charlotte Islands to study the language, customs, physical attributes and social organization of the Haidas. In the course of these investigations he collected a number of vascular plants. The years that Boas visited the Islands are difficult to ascertain in spite of many articles he published on the Haidas and the many biographies that have been written about him. He apparently made extensive visits to the Charlottes at least in the years 1888 and 1897, and may have made short visits in other years. His collections are housed at either the New York Botanical Garden or the United States National Museum at Washington. There is no list of his collections, although a few have been reported in miscellaneous publications.

1891-98. Rev. J. H. Keen was engaged for eight years in missionary work at Masset (Osgood, 1901, p. 8). During these years he made prodigious insect collections and kept bird records. Most of his plant collections were made during the summer of 1898 and are now housed in the New York Botanical Garden herbarium. *Ranunculus hexasepalus* (= *R. occidentalis*) was described from a Keen collection by Benson in 1948.

1895-1923. C. F. Newcombe was a medical doctor and avid amateur anthropologist who spent many summers on the Queen Charlotte Islands. His outstanding collections of Haida artisanship and botanical specimens are now housed in the Provincial Museum at Victoria. The plant collections were made during 10 summers within the period 1895 to 1923. Newcombe did much of his collecting in the vicinity of the Haida villages that are located at the coast. As a consequence, his collections contain many lowland coastal species. Unfortunately, such families as the Cyperaceae and Gramineae, and most of the Filicinae, are poorly represented. The only subalpine or alpine plants collected were those that extend down the exposed west slopes of the Queen Charlotte Ranges to sea level. The endemic *Senecio newcombei* of the Queen Charlotte Islands, described by E. L. Greene, was based on a Newcombe collection. Newcombe's plant collection is certainly

the largest and most significant set of specimens exclusive of our recent surveys. It is unfortunate that he never published any record of his botanical investigations because he was perhaps the only person who had acquired a detailed knowledge of the Haida's use of plants both as medicine and food.

1900. Wilfred H. Osgood was commissioned by the United States Department of Agriculture to conduct a biological exploration of the Queen Charlotte Islands in the summer of 1900. Accompanied by Edmund Heller, he landed on the Islands on June 13 at the fishing station known as Clew, in Cumshewa Inlet. The two men remained on the Islands until July 18. During their stay they explored the head of Cumshewa Inlet and apparently climbed Newcombe Peak. They made several visits to Louise Island before traveling on to Prevost (Kunghit) Island. The party then made their way to Skidegate Inlet, where the survey ended. Osgood collected some 140 taxa that were identified by Frederic V. Coville at the United States National Museum. The collection of *Crataegus douglasii* from Louise Island is of particular interest as this is a rare species on the Islands and is known from only one other station.

1910. W. Spreadborough, one of Canada's outstanding amateur ornithologists, began his collecting career with James Macoun and later accompanied both James and John Macoun on many of their explorations. In 1910, Spreadborough was commissioned to collect biological specimens on the Queen Charlotte Islands. During this survey he made the first collection of what we now know to be the endemic *Saxifraga taylori* in the vicinity of Canoe Pass, near the western entrance to Skidegate Narrows. His collections from this survey are housed at the National Museum in Ottawa.

1912-1914. C. de B. Green, a land surveyor for the British Columbia government, made a few plant collections on the Islands. Unfortunately on the labels of a number of them the locality is not accurate. All of the specimens are housed in the University of British Columbia herbarium at Vancouver.

1925. W. A. Newcombe accompanied his father, Dr. C. F. Newcombe, on visits to the Queen Charlotte Islands several times before his father's death in the fall of 1923. The few collections made by W. A. Newcombe in 1925 are housed at the Provincial Museum at Victoria.

1926-1929. Rev. C. J. Young, an ardent ornithologist, visited the Queen Charlotte Islands in 1926 and 1929 for the express purpose of observing and recording the species of birds that occur there. During the course of these forays he collected a few plants and these are now housed in the Provincial Museum herbarium at Victoria. A few of his collections, such as *Rhamnus purshiana* and *Zygadenus elegans*, represent introductions to the Islands.

1951, 1952. R. W. Pillsbury, of the Department of Biology and Botany, University of British Columbia, Vancouver, made a small number of vascular plant collections during the two summers he spent on the Islands conducting a study on intertidal biota. Professor Pillsbury's collections are housed at the University herbarium in Vancouver.

1951-1956. During this six-year period a number of miscellaneous small collections of vascular plants were made by the following people:
I. McTaggart Cowan (1951), Department of Zoology, University of British Columbia, Vancouver
C. J. Guiget (1952), Provincial Museum, Victoria, British Columbia
F. L. Beebe (1952), Provincial Museum, Victoria, British Columbia
R. L. Schmidt (1952), Research Branch, British Columbia Forest Service, Victoria, British Columbia
W. Ziller (1952), Forest Entomology and Pathology Laboratory, Canada Department of Forestry, Victoria, British Columbia
T. B. Widdowson (1956), a graduate student of algology at the University of British Columbia, Vancouver.

1952-1960. A. Sutherland Brown of the Department of Mines and Petroleum Resources, Victoria, British Columbia, collected plants during the course of his geological surveys of the Islands. Although few actual plant specimens were collected, Dr. Brown made many observations with respect to the vegetation of the Islands and he has an excellent collection of kodachromes of individual plants and plant associations.

1957. J. A. Calder, D.B.O. Savile, and R. L. Taylor, members of the Plant Research Institute at Ottawa, conducted an extensive botanical survey of the Islands from May 23 to August 29. During this period some 2,959 numbers were collected and these collections are represented by approximately 15,000 sheets of plant specimens. The areas surveyed are listed in chronological order.

May 23—Masset
May 24—Haida Point
May 25—Queen Charlotte City to Tlell
May 26—Queen Charlotte City to Skidegate Village
May 27—Queen Charlotte City to Port Clements
May 28—Head of Cumshewa Inlet
May 29—Head of Cumshewa Inlet to Sandspit
May 30—Skidegate Lake; head of Cumshewa Inlet to Mosquito Lake
May 31—Alliford Bay
June 1—Sandspit region
June 2—Alliford Bay
June 3—Masset to Sangan River
June 4—Tow Hill region
June 5—Tow Hill to Rose Spit
June 6—Masset region
June 7—Masset to Tow Hill
June 8—Tow Hill region
June 9—Tlell and Port Clements regions
June 10—Lawnhill to Port Clements
June 11—Skidegate to Skidegate Village
June 12-14—Empire Anchorage; Juskatla region
June 15—Queen Charlotte City; Juskatla to Port Clements region
June 16—Yakoun River delta
June 17—McClinton Creek
June 18-19—McClinton Creek; Tan Mountain
June 21—Skidegate
June 23—Skidegate to Skidegate Village
June 24—Lawnhill region; Chaatl Narrows
June 25—Chaatl Narrows
June 26—Tlell
June 27—Alliford Bay to Sandspit
June 28—Copper Bay to Skidegate Lake
June 29—Sandspit region; Skidegate Lake; White Swan bog
June 30—Head of Cumshewa Inlet; Newcombe Peak
July 1—Red Mud Marsh
July 2—Skidegate, Tlell, and Port Clements regions
July 3—Kumdis Creek
July 5—Bigsby Inlet
July 6—Bigsby Inlet; Bag Harbour
July 7—Skincuttle Inlet region
July 8—Harriet Harbour

July 9—Hotspring Island; Echo Harbour
July 10—Skedans Islands; Limestone Island; Skedans
July 12—Queen Charlotte City
July 13—Torrens Island; Jewell Island; Skidegate; Queen Charlotte City
July 15, 16—Langara Island
July 17—Lepas Bay
July 18—Masset region
July 19—Tow Hill; Yakan Point
July 20—Yakan Point
July 21—Masset to Sangan River; Masset region
July 22—Tlell to Port Clements
July 24—Dawson Inlet
July 25—Between Ells Point and Mercer Point; Lina Island; Newton Point
July 27—Tlell
July 29—Queen Charlotte City; Takakia Lake
July 30-Aug. 2—Takakia Lake
Aug. 4—Tlell
Aug. 5—Alliford Bay to Sandspit; Red Mud Marsh
Aug. 7—Queen Charlotte City to Tlell
Aug. 8-10—Shields Bay; Juskatla
Aug. 11—Skidegate Village to Tlell
Aug. 12—Gray Bay; Sheldens Bay; Skidegate Lake
Aug. 13—Queen Charlotte City to Jungle Beach
Aug. 14—Tlell to Port Clements
Aug. 15—Yakoun River delta
Aug. 16-17—Mount de la Touche
Aug. 18—Mount de la Touche; Fairfax Inlet
Aug. 20—Copper Bay; Skidegate Lake
Aug. 21—Copper Bay to head of Cumshewa Inlet
Aug. 22—Sandspit
Aug. 23—Skidegate region
Aug. 24—Mosquito Mountain
Aug. 27—Mouth of Deena River
Aug. 29—Queen Charlotte City; Kumdis River

1957. H. Persson of the Swedish Museum of Natural History, Stockholm, Sweden, joined the Plant Research Institute botanical survey party for the period July 3 to August 3. Dr. Persson collected a large number of bryophytes and was the first person of the 1957 survey party to find the hymenophyllaceous fern, *Mecodium wrightii*.

1957. E. Mills, a university summer student with the National Museum of Ottawa marine invertebrate survey conducted by Dr. E. L. Bousfield, collected a few vascular plants along the west coast of Moresby Island. Dr. Mills' collections are housed in the Department of Agriculture herbarium in Ottawa.

1960. J. B. Foster and P. Joslin collected a number of vascular plants during the course of a survey of the land mammals of the Queen Charlotte Islands. The first set of specimens is deposited in the University of British Columbia herbarium in Vancouver and there are a few collections in the Department of Agriculture herbarium in Ottawa.

1961. J. B. Foster and M. Bigg obtained a number of plant specimens during the course of a survey led by Dr. J. Bristol Foster. These specimens are housed in the University of British Columbia herbarium at Vancouver and a few duplicates are in the herbarium of the Department of Agriculture in Ottawa.

1961, 1962, 1964. W. B. Schofield, bryologist-ecologist of the University of British Columbia, has made important contributions to our knowledge of the bryophyte flora of the Islands. He accompanied Dr. J. Bristol Foster for a short period in 1961 and returned to the Islands in 1962 for further botanical field work. In 1964 he joined J. A. Calder and R. L. Taylor for

two periods of two weeks each during their summer survey. Dr. Schofield's miscellaneous phanerogamic collections are housed in the University of British Columbia herbarium at Vancouver. His contribution to our understanding of the flora, through both collections and discussions, is commemorated in the endemic *Geum schofieldii*.

1964. J. A. Calder and R. L. Taylor, members of the Plant Research Institute, Ottawa, conducted a summer survey on the Islands from June 3 to August 18 collecting 2,424 numbers that are represented by approximately 10,000 sheets of material. In addition, living plants representative of much of the flora were shipped to Ottawa. Cytological material consisting of both root tips and flower buds totaling some 1,600 collections were made in the field. The areas visited are listed in chronological order.

June 3—Tlell to Port Clements
June 4—Tlell to Skidegate Village
June 5—Image Point
June 6—Port Clements to Masset
June 7—Masset to Tow Hill
June 8—Skidegate to Queen Charlotte City; Honna River
June 9—Limestone Island; South Low Island
June 10—Tuft Islets; Bigsby Inlet
June 11—Richardson Island; head of Anna Inlet
June 12—Crescent Inlet; Low Island; Dass Point
June 14—Queen Charlotte City; Tlell; Port Clements to Juskatla; Blackwater Creek
June 15, 16—Dawson Inlet
June 18—Sandspit to Skidegate Lake
June 19—Cumshewa Inlet region
June 20—Gray Bay; Skidegate Lake region; head of Cumshewa Inlet
June 21—Mosquito Lake; White Swan bog; Mount Moresby
June 22—Near Cape Chroustcheff; Sandspit to Alliford Bay
June 24—Haida Point; Image Point; Queen Charlotte City region; Honna River
June 25—Lawnhill to Tlell
June 26—Tlell to Port Clements; Yakoun River delta
June 27—Juskatla to Yakoun Lake
June 28—Towustasin Hill; Juskatla
June 29—Juskatla to Port Clements; Masset
June 30—Masset to Sangan River; Jalun Lake
July 1—Jalun Lake
July 2—Masset; Port Clements to Tlell
July 5-7—Upper Victoria Lake
July 9—Torrens Island; Skidegate to Skidegate Village
July 10—Queen Charlotte City
July 11—Oeanda River region
July 12—Mouth of Oeanda River to Rose Spit
July 13—Queen Charlotte City
July 14—Haida Point to Tlell
July 15—Head of Long Inlet
July 17—Sandspit region
July 18—Alliford Bay; Sandspit; Copper Bay to Skidegate Lake
July 20—Pure Lake; Mayer Lake; Tlell; Port Clements; Kumdis Creek delta
July 21-22—Kootenay Inlet; Mount Russ
July 23—Queen Charlotte City to Skidegate
July 24—Alliford Bay to Sandspit; head of Cumshewa Inlet
July 25-29—Takakia Lake
July 30—Takakia Lake; head of Cumshewa Inlet
July 31—Mount Moresby
Aug. 1—Head of Cumshewa Inlet; Mount Moresby; Mosquito Mountain
Aug. 2—Head of Cumshewa Inlet; Sandspit; Alliford Bay
Aug. 3—Queen Charlotte City
Aug. 4—Kaisun; Tasu Sound
Aug. 5—Sunday Inlet; Gowdas Islands
Aug. 6—Yakulanas Bay; Mike Inlet
Aug. 8—Skidegate to Jungle Beach
Aug. 9—Sandspit to head of Cumshewa Inlet
Aug. 10—Yakoun Lake
Aug. 11—Masset to Yakan Point
Aug. 12—Masset to Port Clements to Tlell; Yakoun River bridge; Naden Harbour

Aug. 13—Queen Charlotte City to mouth of Honna River
Aug. 14—Queen Charlotte City
Aug. 15—Queen Charlotte City to Skidegate Village
Aug. 16—Queen Charlotte City; Honna River; Tarundl Creek
Aug. 17—Queen Charlotte City; Woodruff Bay; Rose Inlet
Aug. 18—Sandspit

1964. L. C. SHERK, member of the Plant Research Institute, Ottawa, joined the Calder and Taylor survey party for the period June 3 to June 17. Mr. Sherk collected living plant specimens for the developing Canadian Botanical Garden at Ottawa and recorded cultivated shrubs in each of the settlements.

1964. A. VAARMA, of the Botany Department, University of Turku, Finland, joined the Calder and Taylor survey for the period June 5 to June 18. Dr. Vaarma collected cytological and herbarium specimens of bryophytes as well as a few vascular plants.

Physiography

The Queen Charlotte Islands (Figure 2) consist of approximately 150 islands grouped into a triangular-shaped archipelago that lies off the northwest coast of British Columbia. Most of the land mass of this archipelago lies between 52 and 54 degrees north latitude and 131 and 133 degrees west longitude. The Charlottes are approximately 156 miles long; they have a maximum width of about 52 miles and a combined land mass of nearly 3,600 square miles. Skidegate Inlet and Skidegate Channel separate the two main islands, Graham and Moresby. Other islands of appreciable size are Langara off the northwest tip of Graham Island and Louise, Lyell and Burnaby off the east coast of Moresby Island. One of the largest islands, Kunghit, is at the southern extremity of the Moresby Island group. The archipelago is situated on the western rim of the continental shelf. The steeply sloping western margin of the Islands continues into the ocean to a depth of approximately 10,000 feet within a relatively short distance, especially along the coast of Moresby Island. Although the east-facing slope of the Islands is steep in places, the inner coast is abutted by a relatively shallow basin. This body of water, Hecate Strait, is between 50 and 300 feet deep. It separates the Islands from the mainland and is about 30 and 80 miles across at the northern and southern ends respectively.

The descriptive physiography of the Queen Charlotte Islands is based on a paper by Brown (1960). The Islands can be divided into three physiographic units (Figure 2): the Queen Charlotte Ranges, the Skidegate Plateau, and the Queen Charlotte Lowlands. The topography of these three units closely parallels belts of differing geology. The mountains of the Queen Charlotte Ranges, which form the backbone of the Islands, are very rugged and much dissected. In the highest mass between 52°40′N and 53°20′N, a few peaks reach 4,000 feet, but most mountains in this area are between 2,500 and 3,500 feet high. The highest and most rugged portion of the Islands is found in the area between the heads of Cumshewa Inlet, Peel Inlet and Security Cove. North and south from this high mass the mountains gradually decrease in height until they finally disappear below the sea. There are no extensive beaches on the west coast from Rennell Sound to Cape St. James. Wave action is severe along this steep, exposed, rocky coast and eroded material is rapidly carried to deep water. The few coves and fjords are deep-watered and the small, clear streams at their heads carry little material in suspension. The east coast of Moresby Island is indented by numerous coves and inlets and is of lower relief. Gravel or cobble beaches and wave-cut benches occur along this coast and on a number of the islands. The Skidegate Plateau is a partially dissected peneplain that slopes northeastward from the Queen Charlotte Ranges. The plateau consists of table-topped hills and flat ridges that slope gently from about 2,000 feet in the southwest to 500 feet in the northeast. Most of the extensive forest communities that are suitable for logging



Figure 2. Map of the Queen Charlotte Islands showing the three physiographic units: Queen Charlotte Lowlands, Skidegate Plateau, and Queen Charlotte Ranges.

are found within this region. Brown points out that the Skidegate Plateau is underlain by younger rocks than the adjacent Queen Charlotte Ranges. Abutting onto the Skidegate Plateau is the extensive low-lying and boggy Queen Charlotte Lowlands. These Lowlands represent a portion of the Hecate Strait floor that has been slightly raised above sea level. It is an undulating country of coniferous forest and raised bogs dissected by a reticulum of sluggish-moving streams. The bogs are underlain by a mantle of unconsolidated glacial sands and silt that overlie flat or gently dipping Tertiary marine shales and sandstones. The reworking of these unconsolidated materials has resulted in an almost continuous sand or gravel beach from Skidegate Inlet to Masset. A few prominent hills, such as Tow Hill, arise in this lowland. These conspicuous topographic features represent eroded remnants of columnar basaltic sills and other volcanics.

The general topography of the Islands has been considerably altered by seismic activity and glaciation during the geological history of the region. Brown (1960, p. 35-37, Figures 3, 4) has given a concise account of the seismic activity and the extent of the fault lines that occur in the Charlottes. He indicates that the several shears running along the Queen Charlotte Ranges and the extensive shear line found off the west coast of the Islands probably belong to the Denali fault system, one of the major Circum-Pacific shears. Recent earthquake activity is evidenced by the conspicuous and often extensive rock slides found in the Queen Charlotte Ranges. Particularly striking examples of this type of slide activity can be seen along the precipitous west coast (Figure 3).

Figure 3. Fairfax Inlet in Tasu Sound on the west coast of Moresby Island showing earth slides initiated by seismic activity.



The extent of glaciation on the Queen Charlotte Islands has been the subject of much speculation, but the only detailed studies that have been conducted over a considerable period of time have been those of Dr. A. S. Brown of the Department of Mines and Petroleum Resources of British Columbia. In a summary of his findings regarding glaciation on the Islands (1962, p. 218) he states that "the evidence obtained from geological studies clearly indicates that during the Wisconsin period the Queen Charlotte Islands were buried by glacial ice. This ice was generated in the mountainous regions of the islands and flowed outward to join ice from glaciers in the coastal mountains. At the maximum stage of glaciation probably not more than 3.5 square miles of the land surface stood above the glacier ice and this small area was subject to severe arctic climate and swept by snow and rock slides to produce a most inhospitable environment." In addition, Brown suggests that the Islands became ice-free about the same time as other mainland areas of the same latitude. The relationship of glaciation to the degree of plant endemism on the Charlottes is discussed under Phytogeography.

Geology

The published accounts of the geology of the Islands date back to G. M. Dawson's general report in 1880. In 1916, J. D. MacKenzie studied the geology of Graham Island and devoted particular attention to the coal-bearing strata. Recent geological studies were initiated by A. S. Brown and in 1960 Brown and Jeffrey published a preliminary map of Moresby Island. A complete bulletin on the Queen Charlotte Islands is anticipated in the near future.

The following account of the geological history of the Islands is taken from Brown's work (1960, p. 34, 35). He states that "the earliest rocks known are pre-Upper Triassic (older than 200 million years). These are altered basic volcanic rocks many thousands of feet thick. The end of the Triassic period was relatively quiet with the accumulation of several thousands of feet of grey and black limestone and limy mud containing many invertebrate fossils. The Jurassic period began with folding, uplift, and erosion of these earlier rocks and on them were laid a group of conglomerates, sandstones, and shales. This was followed by violent and varied volcanic activity that lasted throughout most of the Jurassic. Extrusion of great sheets of pillow lavas alternated with a thick accumulation of explosive products, forming agglomerates, breccias, and tuffs." The foregoing rock types aggregate more than 10,000 feet in thickness. They are the primary rocks of the Queen Charlotte Ranges. These older rocks were in turn intruded by deep-seated igneous masses (batholiths) mainly at the beginning of the Cretaceous period. Then, according to Brown, "towards the end of the Lower Cretaceous period (100 million years ago) the Queen Charlotte Islands may have crudely resembled the islands today. There was a highland in the west and a low swampy coast to the east much as there is at present. The sea level fluctuated and deposits alternated between conglomerate, sandstone, and shale, and coal which accumulated in the brackish swamps. In turn this deposition came to an end by folding and erosion that led to the formation of the Skidegate Plateau surface. Before this peneplain was uplifted, Miocene marine sands and shale (about 20 million years old) were deposited and these were covered by great floods of thin basalt flows. The uplift, faulting, and local mild folding of the Miocene rocks were the last events before the onset of the Pleistocene glaciation."

Climate[1]

The climate of the Queen Charlotte Islands differs in several respects from the climates of most other parts of Canada. The unusual climatic features have a pronounced effect on the plant life of the Islands.

The main factors that determine the climate of the Queen Charlotte Islands include the proximity of the Pacific ocean to the west, the barrier of mountains on the mainland to the east, the rugged topography of the islands themselves, and the behavior of three prominent features of the general circulation of the atmosphere: the prevailing westerlies, the Aleutian Low (Figure 4) and the North Pacific High (Figure 5).

The ocean tends to be much warmer than the land in winter, and cooler than the land in summer. Most of the air masses that move over the Queen Charlotte Islands are carried by the prevailing westerlies from the direction of the open ocean. The mountain ranges on the mainland generally give protection from continental air masses, which are very cold in winter and hot in summer. Otherwise, these air masses would move out over the Islands from the mainland from time to time. Consequently, winters are very mild and summers are rather cool.

The extensive high-pressure area known as the North Pacific High (Figure 5) dominates the weather along the British Columbia coast, and on the coastal islands from about mid-May to mid-September it promotes rather dry, sunny conditions.

The sharp temperature differences between the relatively warm ocean and the cold continental land areas during the part of the year when the sun is south of the equator help to generate the Aleutian Low. This extensive and constantly changing low-pressure system begins to dominate the weather in late September, as the North Pacific High weakens and moves southward. It contributes to a succession of storms that move in over the Queen Charlottes giving dense cloudiness, heavy precipitation, and strong winds during the fall and winter months (Figure 4).

Moist air moving in from the ocean is forced to rise over the Queen Charlotte mountains. As it rises, it cools, and much of the moisture condenses and falls as rain or snow on the windward slopes. This orographic effect makes precipitation heavier on the west side than elsewhere on the Islands and it is most evident in the wettest months of the year.

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[1]Contributed by G. D. V. Williams, Agrometeorology Section, Plant Research Institute, seconded from the Meteorological Branch, Canada Department of Transport, Toronto, Ontario.

Grateful acknowledgment is extended to the Meteorological Branch, Canada Department of Transport, for supplying climatological data, and to G. Scarcella of the Systems and Programming Section, Data Processing Service, Canada Department of Agriculture, for summarizing frequency data.

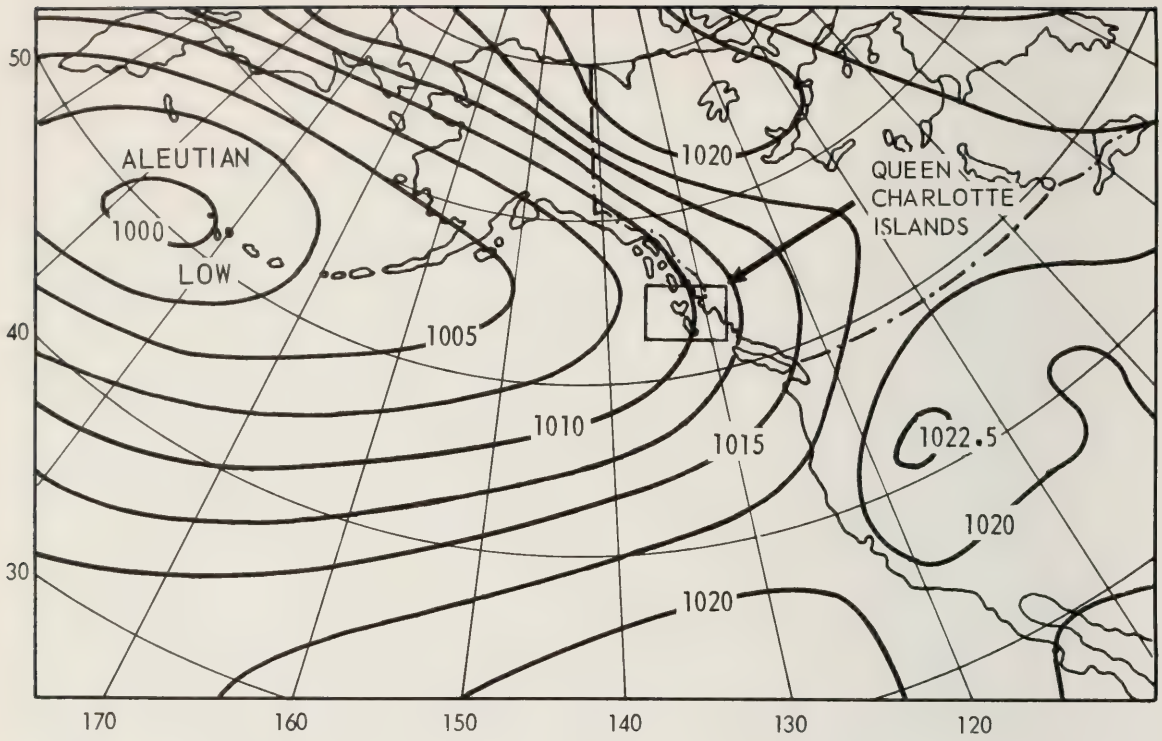


Figure 4. Normal January sea-level pressure in millibars, showing the Aleutian Low. (Adapted from U.S. Weather Bureau Technical Paper No. 21, "Normal Weather Charts for the Northern Hemisphere," 1952.)

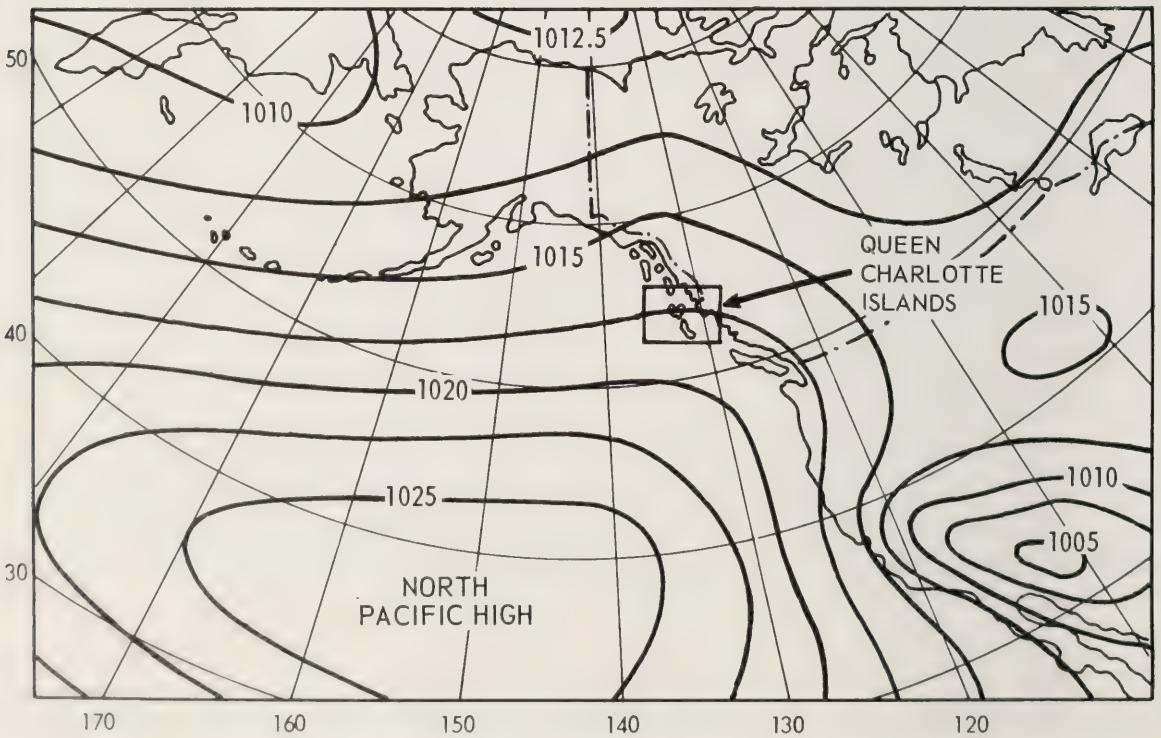


Figure 5. Normal July sea-level pressure in millibars, showing the North Pacific High. (Adapted from U.S. Weather Bureau Technical Paper No. 21, "Normal Weather Charts for the Northern Hemisphere," 1952.)

Available Meteorological Records

Records are on file at the headquarters of the Meteorological Branch of the Canada Department of Transport in Toronto, and have been published in the *Monthly Record, Meteorological Observations in Canada*, for the following stations for most parts of the periods indicated in Table 1.

All but the last four stations listed in Table 1 are still in operation. Breaks in the records have occurred for all stations, and range from a few days to several years. All presently operating stations take temperature readings, but in earlier years many stations made only rainfall and snowfall observations and Masset is the only station with reliable temperature records before 1936.

Table 1. Climatological stations on the Queen Charlotte Islands; geographical position, elevation, and period of record

Station	Latitude	Longitude	Elevation Above Sea Level	Period of Record
Langara	54°15′	133°03′	134 ft.	Aug. 1936 to date
Masset	54°02′	132°08′	10 ft.	June 1897 to date
Tlell	53°35′	131°55′	20 ft.	Jan. 1950 to date
Sandspit Airport	53°15′	131°49′	25 ft.	Oct. 1945 to March 1946 Aug. 1948 to date
Cape St. James	51°56′	131°01′	292 ft.	Aug. 1925 to date
Tasu Sound	52°46′	132°03′	18 ft.	Feb. 1963 to date
Dead Tree Point	53°22′	131°56′	47 ft.	Feb. 1939 to Jan. 1958
Queen Charlotte City	53°13′	132°15′	50 ft.	Jan. 1915 to Dec. 1948
Ikeda Bay	52°17′	131°07′	5 ft.	July 1908 to Aug. 1920
Alliford Bay	53°12′	131°58′	28 ft.	Sept. 1941 to Aug. 1945

It has been difficult to obtain good weather observing sites in many parts of the Islands because of the rugged terrain (Figure 6). Nevertheless the east coast, and the north and south ends of the Islands are represented by climatological stations. The west coast, however, has been represented only by Tasu Sound and only since mid-January 1963, and the upland areas are not represented at all.

Unless otherwise stated, the following discussions and accompanying tables and charts of Queen Charlotte Islands data are based on records for the 17-year period 1947-1963, or as much of that period as available. Some of the analyses were made with punched data cards, which were generally available only from 1947 to 1965. The records for most stations were more complete from 1947 to date than they were up to the mid-forties. Comparison with 30-year normals for some stations secured from the Canada Department of Transport, Meteorological Branch, Climatology Division 1965, CDS 3-65 and 8-65, showed that the 17-year averages were quite close to the 30-year ones. It appeared that, for the purposes of this study, few conclusions could be drawn from the 30-year normals that could not be made just as well from 17-year averages. As this study was oriented toward the effects of climate on plant life in 1957 and in 1964, climatic averages based on the period 1947-1963 seem more relevant than averages based on records including earlier periods.



Figure 6. Looking southeast over Cape St. James lighthouse towards the Kerouard Islands. (Photograph by Bill Lingard, Photo Features, courtesy of Canada Department of Transport.)

Mean and Extreme Temperatures

The mean temperatures of the warmest month of the year in the Queen Charlotte Islands are similar to those in central and northern British Columbia and in the Yukon in western Canada, and to those in an area from James Bay through central Quebec to southern Labrador in eastern Canada. In the coldest month, the British Columbia coast and the coastal islands including the Queen Charlottes have higher mean temperatures than any other parts of Canada (Canada Department of Mines and Technical Surveys, 1957).

The moderating effects of the ocean on temperature are most pronounced at Cape St. James and Langara, which are the stations most exposed to the ocean. Differences caused by latitude, and differences between parts of a day, days of a month, or seasons of a year, are much smaller than the differences would be at locations far from the ocean. Langara is 160 miles farther north than Cape St. James but the average mean temperatures of these places differ by less than a degree Fahrenheit in the summer months and less than 2½ degrees in the winter (Figure 7).

At Cape St. James and Langara, the mean temperature of any month rarely departs from the long-term average for that month by more than 5 or 6 degrees in the winter or 3 to 5 degrees in the summer. The range between the average daily maximum and average daily minimum temperatures is about 6 or 7 degrees in fall and winter and 7 or 8 degrees in spring and summer (Figures 8 and 9). In an average month the extreme minimum and the extreme maximum tempera-

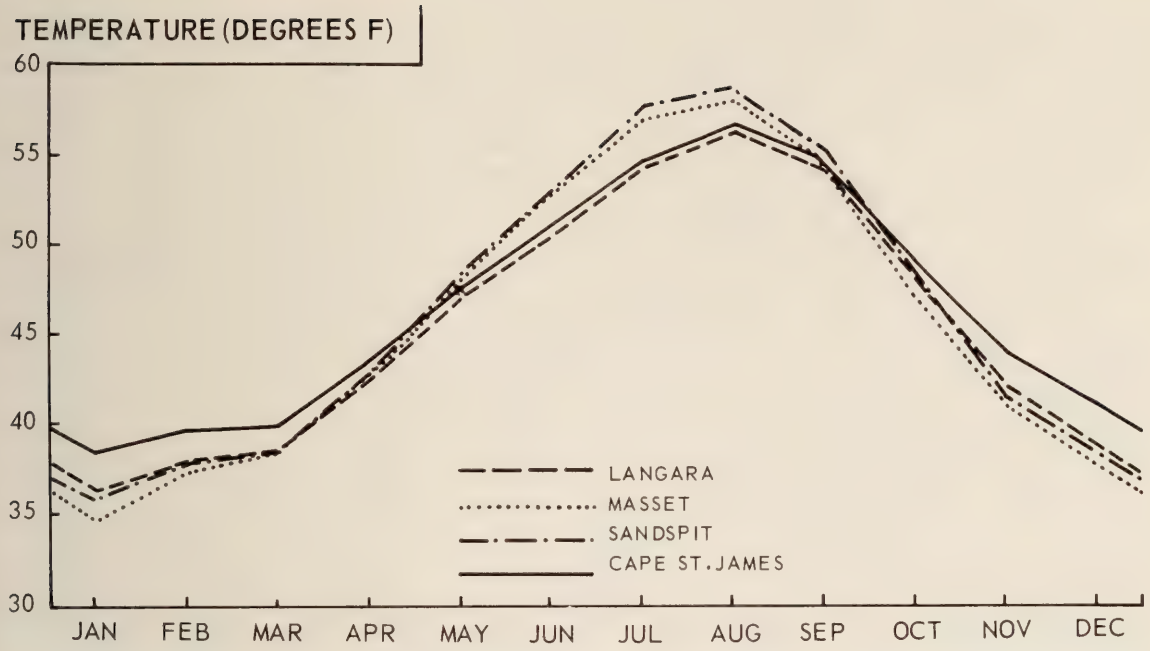


Figure 7. Average monthly mean temperatures for Langara, Masset, Sandspit, and Cape St. James climatological stations (see Table 2).

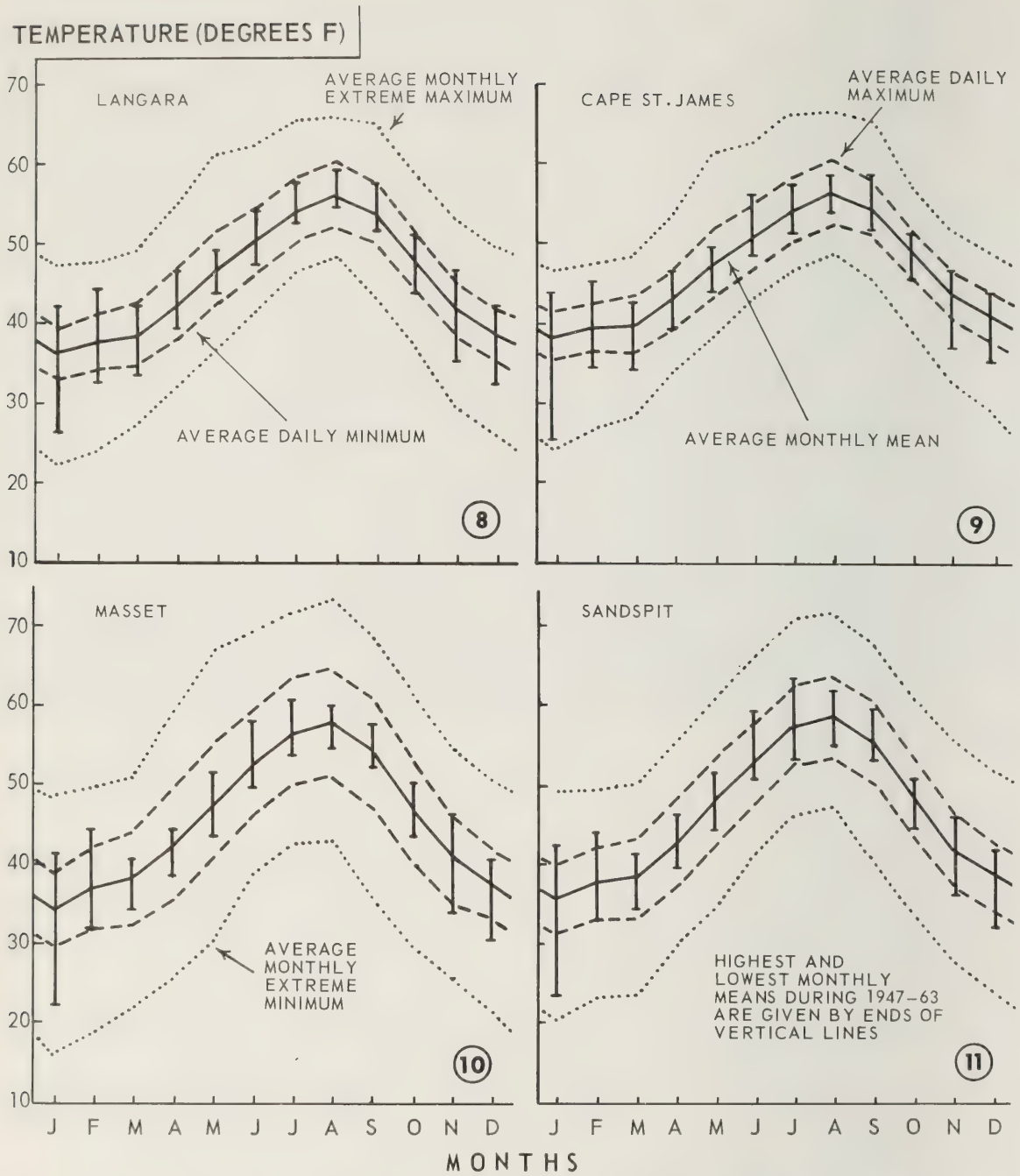
tures differ by only 17 to 20 degrees in the summer and by not more than 25 degrees in the winter.

Variations in temperature between one station and another are more closely related to the degree of protection from the open ocean than they are to latitude. The average mean annual temperature (Table 2) at Sandspit is only slightly higher than at Masset, and both stations are warmer in the summer than Cape St. James, which is much farther south. In winter, Sandspit is about as cold as Langara and Masset is colder (Figure 7).

Table 2. Annual temperature and precipitation data for Langara, Masset, Sandspit, and Cape St. James for the period 1947-1963*

	Langara	Masset	Sandspit	Cape St. James
Temperature (°F)				
Average extreme maximum for year....	69.8	75.8	73.0	70.8
Average daily maximum.....	49.3	51.7	51.2	50.1
Average mean temperature.....	45.5	45.7	46.3	46.7
Average daily minimum.....	41.7	39.6	41.4	43.2
Average extreme minimum for year....	16.0	12.2	15.9	19.5
Difference between average January and August mean temperatures.....	19.7	23.2	22.6	18.3
Precipitation				
Average total precipitation (inches).....	66.04	55.08	50.09	56.66
Percentage of average precipitation total due to snowfall.....	3.7	5.2	5.7	1.3
Average number of days per year with measurable precipitation.....	249.4	214.0	205.3	236.3

*At Sandspit records were only available starting in August 1948. At the other stations data were missing for occasional months.



Figures 8-11. Means and extremes of air temperatures at Langara, Cape St. James, Masset, and Sandspit climatological stations (see Table 2).

The range between the average daily maximum and minimum temperatures is greater at Masset and Sandspit (Figures 10 and 11) than at Cape St. James or Langara. The contrast is greatest between Masset and Cape St. James (Figure 12). At Masset the range averages about 9 or 10 degrees in winter and 13 or 14 degrees in spring and summer. This range is about one and a half or two times the corresponding ranges at Cape St. James. The difference between the extreme lowest minimum and highest maximum temperature in a month is normally about 30 degrees at Masset; this is much greater than at Langara and Cape St. James

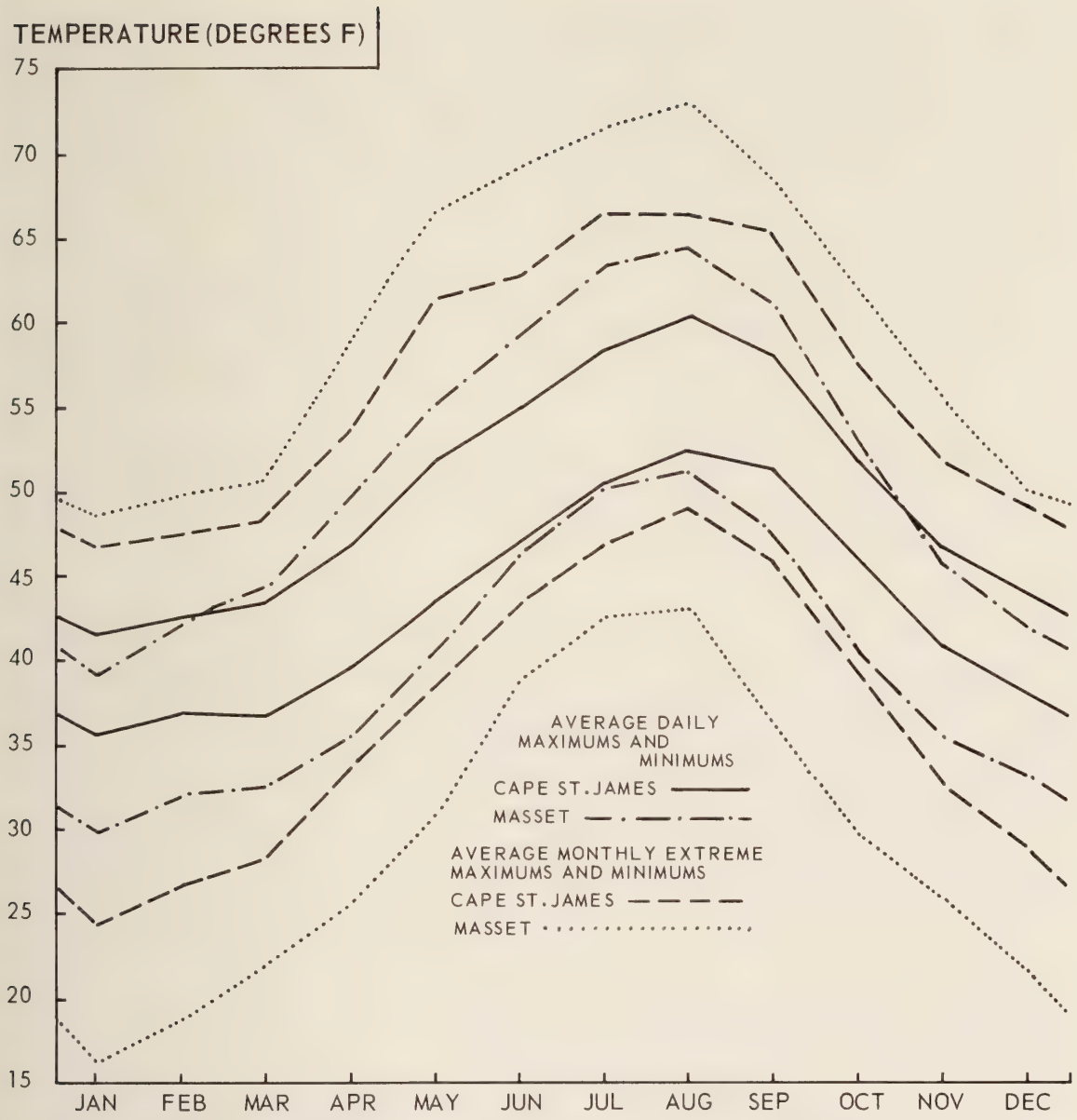


Figure 12. Average daily and monthly maximum and minimum air temperatures at Cape St. James and Masset (see Table 2).

(Figures 12 and 8 to 10). The highest and lowest temperatures ever recorded on the Queen Charlotte Islands, namely +84° and −2°F, were recorded at Masset.

At most inland stations in Canada, July is the warmest month of the year. Because of the slowness of the ocean to change temperature, the warmest month on the Queen Charlotte Islands is usually August, rather than July. January is the coldest month. The difference between average August and January temperatures is about 18 degrees at Cape St. James, 20 degrees at Langara and 23 degrees at Sandspit and Masset (*see* Table 2). These differences are much smaller than the differences in temperature between the warmest and coldest months at most other stations in Canada.

Temperatures on the west coast are similar to those in other parts of the Islands. Mean daily maximum and minimum temperatures for Tasu Sound,

Sandspit, and Cape St. James, for the months in the period February 1963 to October 1964 are similar. The Tasu Sound temperature is often closer to that of either Sandspit or Cape St. James than the last two are to each other. Tasu Sound is somewhat protected from the open ocean, and the range between the daily maximum and minimum temperatures resembles the range at Sandspit more than that at Cape St. James.

Growing Degree Days

The average annual totals of degree days above 42°F, computed from data for the 5-year period 1957-1961, are: 2,333 at Cape St. James, 2,182 at Langara, and 2,429 at Sandspit (Boughner, 1964). These values are higher than those in Newfoundland, and correspond to the averages along the nothern edge of the chief agricultural areas in most other provinces. It is likely, however, that 90 to 95 percent or more of the growing degree days above 42°F on the Queen Charlotte Islands occur during the frost-free period, and this percentage is higher than in most agricultural areas of Canada.

Frost-free Periods

The effect of the ocean on the lengths of frost-free periods is particularly pronounced. The frost-free period is defined as the period between the last spring and first fall frosts. A spring frost is defined as the occurrence of a minimum temperature of 32°F or less in the Stevenson screen on or before July 15, and a fall frost is a similar occurrence after that date (Canada Department of Transport, Meteorological Branch, 1956).

Cape St. James, which is most influenced by the ocean, has a longer frost-free season than most other stations in Canada. It is 266 days long, on the average, and extends from late March to mid-December (Table 3, Figure 13).

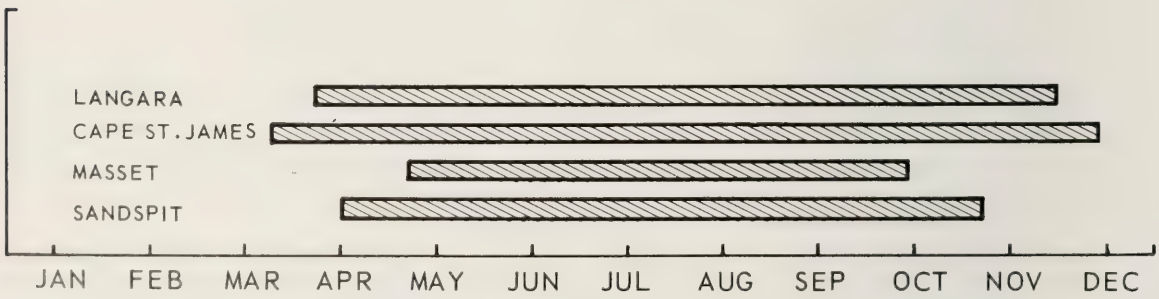


Figure 13. Average length of frost-free period at Langara, Cape St. James, Masset, and Sandspit (see Table 2).

At Masset, which is much less exposed to the influence of the ocean, the average frost-free season is from early May to mid-October and is 158 days long. This length is similar to the frost-free periods in the warmest parts of southwestern Ontario and southern Nova Scotia (Canada Department of Mines and Technical Surveys, 1957).

Langara and Sandspit have frost-free periods that are intermediate in length between those at Cape St. James and Masset. Sandspit, which is less

exposed to the ocean than Langara, has shorter frost-free periods than Langara.

Occasionally at Langara, and more often at Cape St. James, the first fall frost does not occur until on into the new year. An extreme case occurred at Cape St. James in 1957-58. The lowest minimum temperature at Cape St. James between March 5, 1957, and December 5, 1958, was 32°F on March 21, 1958. Thus, March 21, 1958, was the date of the first fall frost for the 1957 season (381-day frost-free period), and the date of the last spring frost of the 1958 season (259-day frost-free period).

From the more limited records available, Tlell seems to have frost-free periods similar to those at Masset, and Tasu Sound seems to be intermediate between Masset and Sandspit in the length and dates of its frost-free period.

Table 3. Date of last spring frost and of first fall frost, and length of frost-free period at Langara, Masset, Sandspit, and Cape St. James on the Queen Charlotte Islands (*see* Table 2)

	Date of last spring frost			Date of first fall frost			Length of frost-free period (days)		
	Earliest	Average	Latest	Earliest	Average	Latest	Shortest	Average	Longest
Langara	Mar. 7	Apr. 8	May 21	Oct. 22	Dec. 1	Jan. 29*	175	237	324
Masset	Apr. 19	May 8	May 22	Sept. 21	Oct. 13	Nov. 5	123	158	185
Sandspit	Mar. 9	Apr. 17	May 7	Sept. 22	Nov. 10	Dec. 5	178	207	254
Cape St. James	Feb. 21	Mar. 22	Apr. 25	Oct. 25	Dec. 13	Mar. 21*	184	266	381

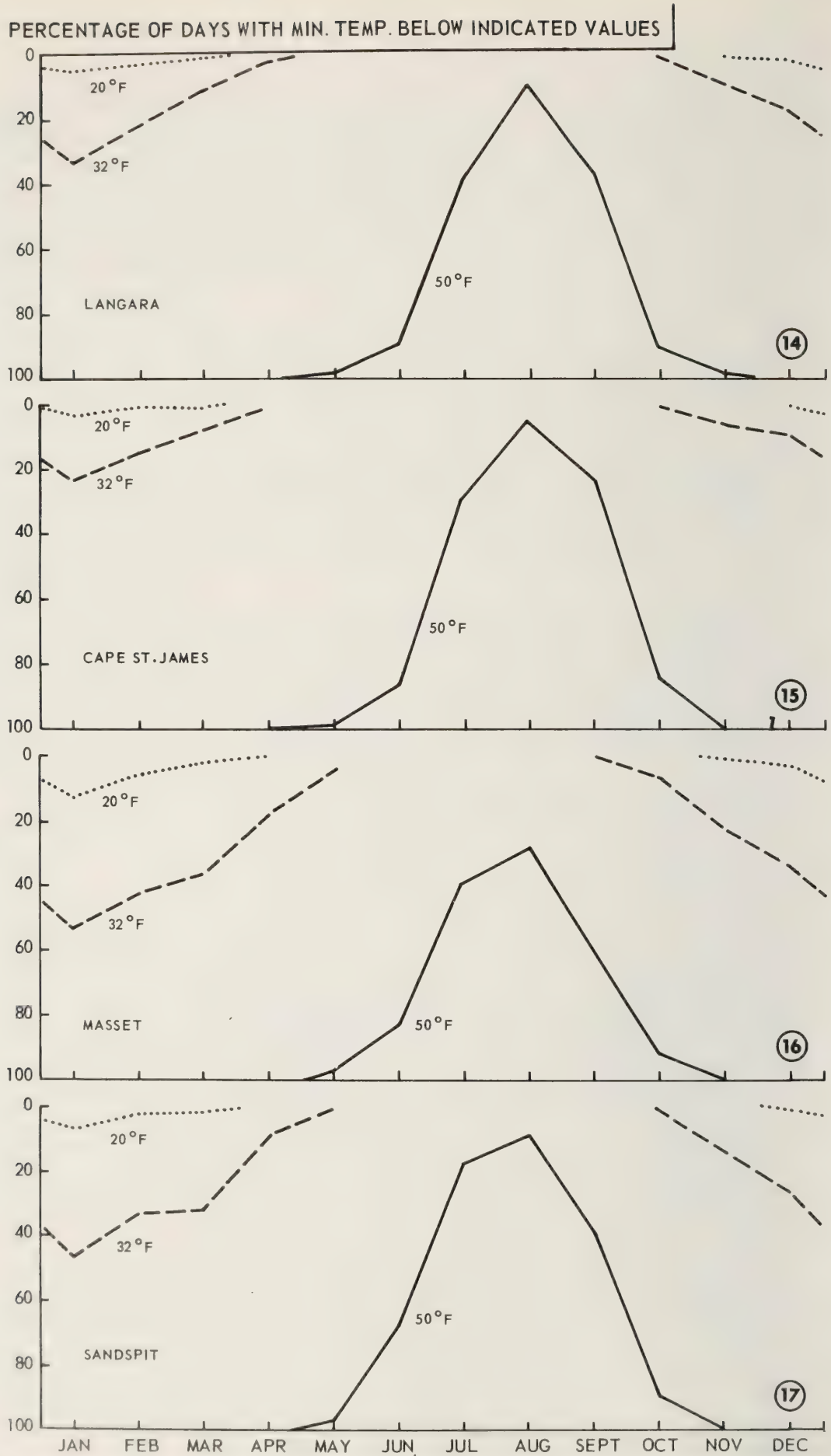
*Date of first fall frost is the first day after any July 15 with minimum temperature of 32°F or lower.

Percentage Frequencies of Minimum Temperatures

Most of the days with minimum temperatures no lower than 50°F occur in the July to September period (Figures 14 to 17). In August, the warmest month, the percentage of days with a minimum below 50°F is nearly 30 at Masset but less than 10 at Langara, Cape St. James and Sandspit (Table 4).

The smaller proportion of days free of minimum temperatures below 50°F at Masset (Figure 16), and the greater range between maximum and minimum temperatures at this place, are due to relatively effective protection from the moderating influence of the ocean. The temperature range at Sandspit is also greater than at Cape St. James and Langara, but it is considerably less than at Masset. Sandspit, which is farther south, has a higher average mean temperature than Masset. Thus the proportion of days free of minimums below 50°F is substantially greater at Sandspit (Figure 17) than at Masset.

The arrival of the warmest part of any season is generally most delayed at locations where the influence of the ocean is strongest. This is reflected in the percentages of days with minimum temperatures below 50°F. While all stations have their lowest percentages in August (Table 4), Cape St. James and Langara have somewhat lower percentages in September than in July. But Sandspit and Masset, which are less influenced by the ocean, have much lower percentages in July than in September.



Figures 14-17. The percentage of days at Langara, Cape St. James, Masset, and Sandspit with minimum temperatures below 20°, 32°, and 50°F (see Table 4). (The area under each curve represents the proportion of days in the year free of temperatures below the value indicated on the curve.)

The time of the year with fewest daily minimums below 50°F is just after mid-August at Langara and Cape St. James, but one to two weeks earlier at Masset and Sandspit. June and July percentages are substantially lower at Sandspit than at any other station, although the percentages for August at Sandspit are similar to the Langara and Cape St. James values.

Even in the coldest month, January, the daily minimum temperatures are below 32°F only on about 50 percent of all days at Masset, somewhat less often at Sandspit, and on about one third and one quarter of all days at Langara and Cape St. James respectively. The percentages of January days with minimum temperatures below 20°F are 13 percent at Masset and from 4 to 7 percent at the other stations.

The proportions of days with temperatures below 32°F and below 20°F again reflect the degree of oceanic influence (Figures 14 to 17). Masset has the smallest proportion and Cape St. James the greatest, but the proportions at Langara are only slightly less than at Cape St. James, and the proportions at Sandspit are most similar to those at Masset.

Table 4. The percentage of days with minimum temperatures below 50°F, 32°F, and 20°F for the period 1947-63 at Langara, Cape St. James, Masset, and Sandspit* on the Queen Charlotte Islands

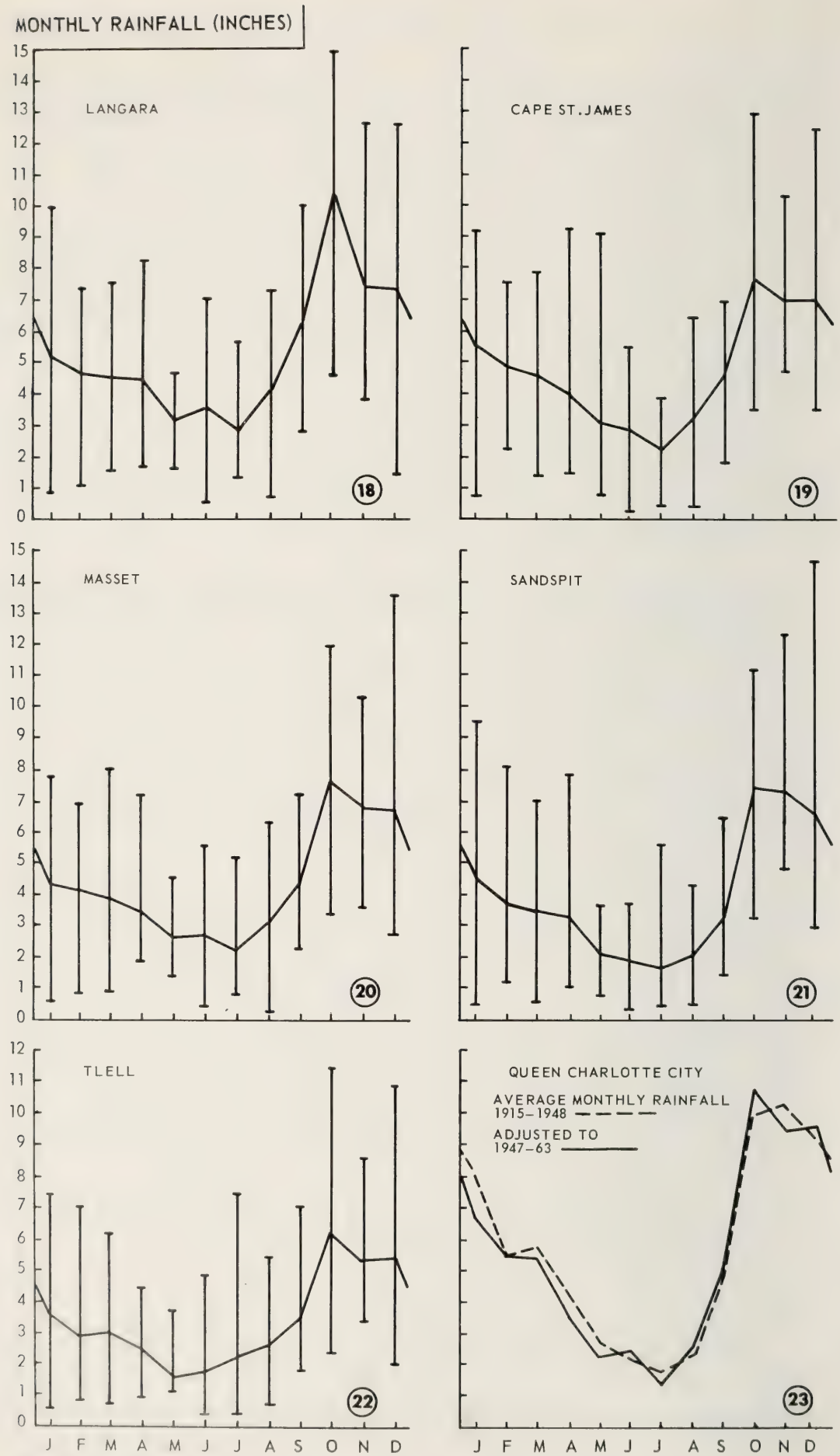
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Below 50°F												
Langara	100	100	100	100	99	89	39	8	36	91	99	100
Cape St. James	100	100	100	100	98	86	30	5	23	84	100	100
Masset	100	100	100	100	97	83	40	28	60	91	99	100
Sandspit	100	100	100	100	97	68	17	8	38	89	100	100
Below 32°F												
Langara	33	22	15	3	0	0	0	0	0	0	8	17
Cape St. James	23	14	8	1	0	0	0	0	0	0	5	9
Masset	52	43	36	18	5	0	0	0	0	7	23	35
Sandspit	46	33	31	8	1	0	0	0	0	1	14	27
Below 20°F												
Langara	5	3	2	0	0	0	0	0	0	0	0	2
Cape St. James	4	1	1	0	0	0	0	0	0	0	0	1
Masset	13	6	2	0	0	0	0	0	0	0	1	3
Sandspit	7	2	2	0	0	0	0	0	0	0	0	1

*Period 1949-1963 used for Sandspit. Data were missing for occasional months at other stations.

The patterns of percentages of days with minimum temperatures below various levels at Tasu Sound are similar to those at Sandspit.

Precipitation Amounts

The total annual precipitation (Table 2) over most of the east side of the Queen Charlotte Islands and the north and south ends is similar to the amounts received over most parts of eastern Vancouver Island, the coast of the southern British Columbia mainland, Nova Scotia, and southern Newfoundland (Canada Department of Mines and Technical Surveys, 1957). Annual precipitation over



Figures 18-23. Average and extreme highest and lowest monthly rainfall for Langara, Cape St. James, Masset, Sandspit, Tlell, and Queen Charlotte City (see Table 2). Curves give average rainfall. In Figures 18-22 ends of vertical lines denote heaviest and lightest rainfall, 1947-63. In Figure 23 the extremes are based on the period 1950-63, but the averages have been adjusted to the 1947-63 period by using Dead Tree Point data.

the western parts of the Queen Charlotte Islands, like that on parts of western Vancouver Island and of the British Columbia mainland coast facing Queen Charlotte Sound and Hecate Strait, is among the highest in Canada. It is more than double the annual precipitation in any part of Canada east of the Rocky Mountains.

The seasonal variation of precipitation is pronounced (Tables 5 and 6, and Figures 18 to 25). From about mid-May to mid-September, under the influence of the North Pacific High, storms are apt to be infrequent and weak, especially toward the southern end of the Islands. Winds are lighter and air flow is more often from the northwest or west at this time than in the winter.

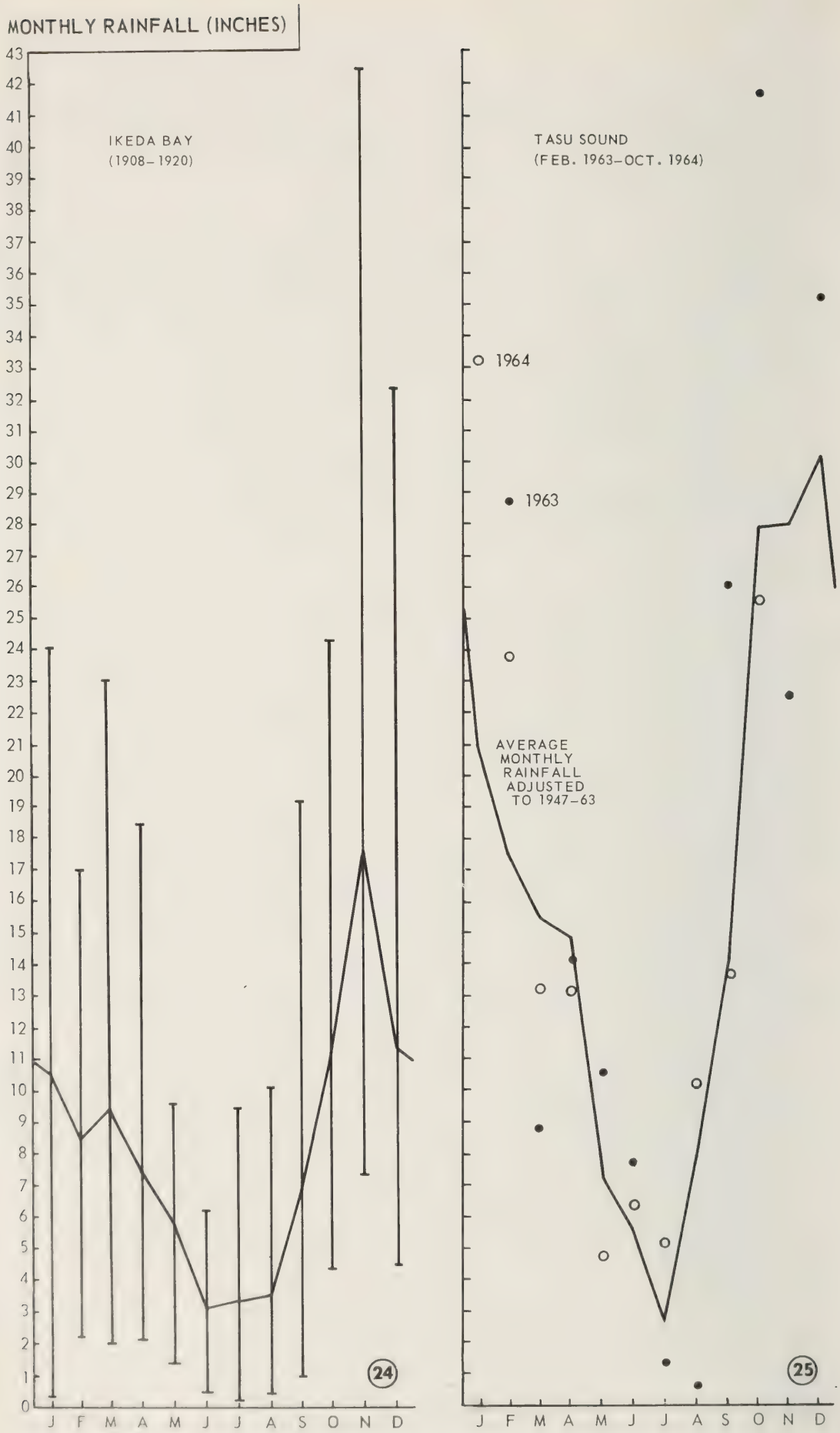
During the second half of September the influence of the Aleutian Low begins to predominate, and what might be called the rainy season begins rather abruptly. Frequent and often severe storms move in from the open Pacific, and they may stall off the coast or be deflected northwestward or southeastward along the coast as they approach the coastal mountains of the mainland. In this way, the Queen Charlotte Islands are affected by more storms and for more of the time than they would be if the storms approaching the coast were able to move straight inland.

Average summer precipitation (June to August) at Dead Tree Point, Tlell, Sandspit and Queen Charlotte City is between 5 and 7 inches, which is similar to summer precipitation in the Prairie Provinces. Farther to the north, Masset averages 8 inches, and Langara, which is more exposed, 11 inches, of June to August precipitation. Cape St. James, which is exposed but is far to the south, receives about the same amount as Masset. The average summer precipitation at Cape St. James, Masset and Langara is similar to the summer averages over most of Canada from Manitoba eastward (Canada Department of Mines and Technical Surveys, 1957). From June to August Tasu Sound appears to get about 50 percent more precipitation than the wetter parts of most provinces.

In the other seasons, exposed parts of the British Columbia coast and the coastal islands including the Queen Charlottes receive much more precipitation than parts of Canada east of British Columbia. This is particularly so in the fall and winter. In each of these seasons Tasu Sound apparently receives about 70 inches of precipitation and the other stations between 12 and 25 inches.

At most stations July is the driest month and October the wettest. There is a sharp increase in the average monthly rainfall from July to October, followed by a gradual decrease through the winter and spring months (Figures 18 to 25). The ratio obtained by dividing average October rainfall by average July rainfall is about 10 at Tasu Sound. The corresponding ratio is about 6 at Queen Charlotte City, 4 at Sandspit, and between 3 and 4 at Langara, Masset and Cape St. James. At Tlell, which is the station most protected from the ocean, the driest month is May rather than July, and October rainfall is about four times as heavy as May rainfall.

No routine measurements were made of the climate of the west side of the Queen Charlottes until 1963, when the climatological station was opened at Tasu Sound. In spite of the very rugged nature of the terrain, which causes great variability in precipitation and which has made it necessary to locate the Tasu Sound observing station on a hillside (Figures 26 and 27), the precipitation



Figures 24 and 25. Monthly rainfall at Ikeda Bay and Tasu Sound. These figures are to the same scale as Figures 18-23. Curves give average rainfall. In Figure 24, ends of vertical lines denote heaviest and lightest rainfall, 1908-20. In Figure 25, average monthly rainfall has been adjusted to 1947-63. Note the much greater contrast between the dry season and the rainy season at Tasu Sound than at any other station.

measured there is fairly typical of amounts to be expected on the west side of the Islands.

During the first 21 months of operation, that is from February 1963 to October 1964, Tasu Sound reported a total of almost 350 inches of precipitation, of which over 347 inches was rainfall, making it one of the rainiest stations in

Table 5. Rainfall averages and extremes, in inches, at Langara, Masset, Tlell, Sandspit, and Cape St. James (*see* Table 2)

Average	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Langara	5.13	4.65	4.49	4.47	3.07	3.65	2.88	4.09	6.29	10.29	7.33	7.26	63.60
Masset	4.34	4.15	3.98	3.51	2.64	2.74	2.28	3.06	4.42	7.64	6.78	6.67	52.21
Tlell*	3.66	2.92	3.02	2.44	1.62	1.82	2.22	2.68	3.66	6.27	5.40	5.51	41.22
Sandspit	4.61	3.83	3.49	3.23	2.03	1.93	1.75	2.05	3.22	7.30	7.20	6.58	47.22
Cape St. James	5.57	4.84	4.50	3.94	3.00	2.82	2.08	3.12	4.49	7.66	6.93	6.97	55.92
Heaviest on record													
Langara	9.92	7.23	7.51	8.24	4.62	7.00	5.69	7.17	10.07	14.99	12.63	12.44	
Masset	7.89	6.97	8.01	7.07	4.69	5.67	5.23	6.38	7.25	12.04	10.36	13.61	
Tlell*	7.39	7.00	6.17	4.34	3.76	4.94	7.45	5.32	7.03	11.42	8.52	10.83	
Sandspit	9.63	8.04	6.94	7.88	3.65	3.75	5.53	4.17	6.40	11.01	12.25	14.66	
Cape St. James	9.13	7.55	7.92	9.14	9.03	5.33	3.88	6.40	6.91	12.97	10.27	12.40	
Lightest on record													
Langara	0.89	1.04	1.48	1.60	1.64	0.52	1.28	0.80	2.79	4.47	3.73	1.28	
Masset	0.57	0.77	0.97	1.91	1.36	0.31	0.93	0.15	2.30	3.49	3.67	2.81	
Tlell*	0.62	0.94	0.74	0.91	1.05	0.33	0.36	0.65	1.88	2.32	3.36	2.08	
Sandspit	0.32	1.11	0.51	1.07	0.89	0.26	0.33	0.31	1.41	3.18	4.86	2.93	
Cape St. James	0.61	2.15	1.32	1.36	0.79	0.07	0.32	0.27	1.81	3.49	4.61	3.44	

Table 6. Snowfall averages and extremes, in inches, at Langara, Masset, Tlell, Sandspit, and Cape St. James (*see* Table 2)

	Jan.	Feb.	Mar.	Apr.	May	Oct.	Nov.	Dec.	Year
Average									
Langara	7.2	3.9	5.1	1.0	0	0.2	2.1	4.9	24.4
Masset	11.0	6.1	2.7	0	0	0.1	2.3	6.5	28.7
Tlell*	7.7	5.5	2.0	0.1	0	0	1.9	4.0	21.2
Sandspit	9.1	7.0	4.7	0.5	0.1	0	3.3	4.0	28.7
Cape St. James	2.1	1.3	2.5	0.1	0	0	0.2	1.2	7.4
Heaviest on record									
Langara	24.1	21.4	21.8	9.5	0	4.0	15.0	21.1	
Masset	40.0	20.0	10.8	0	0	2.0	15.5	36.7	
Tlell*	19.9	19.0	9.0	0.8	0	0.5	12.0	18.5	
Sandspit	23.0	21.6	19.3	2.8	0.6	0.1	12.5	17.8	
Cape St. James	10.5	6.4	17.7	1.5	0	0	0.9	3.7	
Relative frequency of months without measurable snow									
Langara	2/16	7/17	3/17	9/17	17/17	16/17	9/17	8/17	
Masset	2/16	6/16	8/17	17/17	17/17	16/17	8/16	3/16	
Tlell*	3/14	6/14	4/14	12/14	14/14	13/14	6/14	6/14	
Sandspit	2/15	3/15	2/15	9/15	13/15	15/16	6/16	3/16	
Cape St. James	7/17	9/17	8/17	12/17	17/17	17/17	11/17	8/17	

*The Tlell extremes are based on the period 1950-63 but the Tlell averages have been adjusted to the 1947-63 period by use of Dead Tree Point data.



Figure 26. Tasu Sound weather observing site (looking east-northeast). (Photograph courtesy of Canada Department of Transport, Meteorological Branch.)



Figure 27. Tasu Sound weather observing site (looking north-northwest). (Photograph courtesy of Canada Department of Transport, Meteorological Branch.)

Canada for the period. If for each month of the year, the ratios between long-term average rainfall at Tasu Sound and at other stations on the Islands (Table 7) are the same as the ratios during the 21-month period referred to above, the average annual rainfall at Tasu Sound, based on the 17-year period, would be 193 inches.

It is interesting to compare the Tasu Sound records with those of Henderson Lake (Kildonan), a station on southwestern Vancouver Island which was closed in 1957. Boughner and Thomas (1960) quoted the following precipitation records for Henderson Lake:

Average annual total precipitation for 14-year period	262.00 inches
Greatest total precipitation for one calendar year (1931)	323.70 inches
Average total precipitation during the wettest month (Dec.)	46.70 inches
Total precipitation during the wettest month on record (December 1923)	79.45 inches
Greatest precipitation in one day (December 30, 1926)	16.61 inches

The Henderson Lake climatological station was at the head of a funnel-shaped valley and it seems likely that it was subject to local intensification of precipitation. The Tasu Sound station, on the other hand, is on the south side of its sound, not at the head. The sound has a narrow mouth, the observing site is on the shore of the wider inner portion, and air flow within the sound is more or less parallel with the shore of the sound.

In the Tasu Sound area the effect of the air moving in from the Pacific and being lifted up the western slopes of the Queen Charlotte mountains would

be strong, but it would probably be fairly typical of the orographic effect along the whole west side of the Queen Charlotte mountain range. This is in contrast to conditions at Henderson Lake, where the orographic lift is probably stronger than it is over most of the west side of Vancouver Island.

Table 7. Precipitation, in inches, at weather stations on the Queen Charlotte Islands

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Rainfall												
1963												
Langara	—	7.23	2.63	3.38	4.20	5.53	1.88	0.80	10.07	11.94	6.32	7.34
Masset	—	6.97	1.62	3.23	4.10	4.27	2.09	0.15	5.99	9.23	5.02	7.49
Tlell	—	7.00	1.57	1.20	3.41	2.94	2.03	0.66	7.03	8.31	5.13	7.46
Sandspit	—	8.04	1.66	1.43	2.59	2.44	1.31	0.31	6.40	11.01	6.13	8.49
Cape St. James	—	6.91	1.32	3.10	1.70	3.35	1.98	0.27	6.91	11.60	4.61	7.78
Tasu Sound	—	28.81	8.76	14.12	10.69	7.80	1.33	0.65	26.06	41.83	22.69	35.23
1964												
Langara	8.09	7.53	6.50	6.67	2.94	3.17	4.30	4.79	8.04	9.81	—	—
Masset	7.75	4.50	3.03	3.50	1.86	3.12	3.59	3.50	4.75	9.66	—	—
Tlell	6.60	3.26	2.12	2.12	1.70	2.09	3.46	3.10	5.78	7.57	—	—
Sandspit	7.24	4.23	1.57	3.01	1.93	3.07	2.97	2.34	3.70	7.66	—	—
Cape St. James	6.78	5.36	5.57	4.63	1.88	2.57	2.71	4.28	4.10	7.89	—	—
Tasu Sound	33.14	23.87	13.13	13.09	4.83	6.39	5.10	10.13	13.89	25.72	—	—
Snowfall												
1963												
Langara	—	0	3.5	1.5	0	0	0	0	0	0	15.0	0
Masset	—	0	6.0	0.0	0	0	0	0	0	0	15.5	0
Tlell	—	0	T	T	0	0	0	0	0	0	12.0	0
Sandspit	—	1.0	0.8	0.3	0	0	0	0	0	0	5.0	T
Cape St. James	—	0	0.1	0.1	0	0	0	0	0	0	0.2	0
Tasu Sound	—	0	5.2	0.2	0	0	0	0	0	0	5.8	0
1964												
Langara	4.0	T	2.5	0	T	0	0	0	0	0	—	—
Masset	5.0	0	0.5	T	0	0	0	0	0	0	—	—
Tlell	4.0	T	T	T	T	0	0	0	0	0	—	—
Sandspit	4.2	0.7	1.1	0.5	0.2	0	0	0	0	0	—	—
Cape St. James	3.3	0.5	2.4	T	0	0	0	0	0	0	—	—
Tasu Sound	14.5	0	0.8	T	0.5	0	0	0	0	0	—	—
Heaviest 24-hour precipitation												
1963												
Langara	—	1.14	0.51	0.63	0.78	0.96	0.52	0.23	1.13	1.39	0.90	1.31
Masset	—	1.15	0.61	0.93	0.74	0.48	0.58	0.14	1.50	1.24	1.32	1.56
Tlell	—	1.49	0.56	0.33	1.14	0.41	0.70	0.28	1.54	.99	1.31	0.82
Sandspit	—	1.15	0.52	0.49	1.09	0.49	0.39	0.13	0.94	1.71	0.95	1.03
Cape St. James	—	1.27	0.31	0.58	0.35	1.14	0.27	0.11	1.03	1.71	0.99	1.15
Tasu Sound	—	5.23	2.01	3.58	2.22	1.99	0.36	0.52	4.58	4.79	2.99	4.20
1964												
Langara	1.20	0.60	1.24	0.91	0.68	0.59	0.72	0.88	0.83	1.70	—	—
Masset	1.11	0.86	0.74	0.63	0.51	0.55	0.85	0.61	1.35	1.36	—	—
Tlell	1.15	0.69	0.41	0.48	0.36	0.59	0.61	M	0.96	1.29	—	—
Sandspit	1.24	0.93	0.30	0.70	0.31	0.97	0.74	0.33	0.63	1.07	—	—
Cape St. James	0.90	0.77	1.31	1.02	0.29	0.55	0.63	0.82	0.73	1.28	—	—
Tasu Sound	7.58	3.71	2.22	2.28	1.02	1.80	1.38	2.20	2.50	2.95	—	—

M indicates missing record, T stands for trace.

On the west side of the Queen Charlotte Islands there are probably some locations that receive much less and at least as many that get much more rain than Tasu Sound receives. Average annual precipitation ranging from less than 50 inches in some locations to more than 300 inches in others would seem quite possible on the west side of the Queen Charlottes.

On the basis of the February 1963 to October 1964 data, rainfall at Tasu Sound in July ("adjusted average" curve, Figure 25) appears to be about 1.2 times the combined average of the July rainfall totals at Langara, Masset, Tlell, Sandspit and Cape St. James. Throughout the rest of the year Tasu Sound receives more than twice as much, and in the period November to April over four times as much rainfall as the other stations. During unusually wet periods, rainfall is much heavier at Tasu Sound than at the other stations, but during dry periods, rainfall may be just as light at Tasu Sound as it is elsewhere on the Islands. For example, in October 1963, when the other stations received between 8 and 12 inches of rain, 41 inches fell at Tasu Sound. But in August 1963, when the greatest rainfall for the month at any station on the Queen Charlotte Islands was 0.80 inches (at Langara), Tasu Sound had only 0.65 inches.

It appears that the orographic influence at Tasu Sound has least effect during periods when rain is light and infrequent. At such times the air is not moist enough to produce much rain, even when lifted up the western slopes of the Queen Charlotte mountains, and the rainfall may be no greater at Tasu Sound than at the other stations. When the air is moist enough to provide moderate amounts of rainfall at the other stations, however, the orographic lift usually results in much heavier rain at Tasu Sound. This orographic lift thus greatly increases the contrast between dry and wet periods at Tasu Sound.

The contrast between the driest and wettest months of the year at Queen Charlotte City is more like the west side of the Islands than Masset, Tlell, or Masset and Tlell but much less than at Tasu Sound. Some of the highest mountains on the Islands are west of Queen Charlotte City but there is a break in the mountain chain to the southwest along the Skidegate Channel. This may modify the rain shadow effect so that from the standpoint of climate, Queen Charlotte City is more like the west side of the Islands than Masset, Tlell, or Sandspit are.

The Ikeda Bay climatological station (probably the same observing site as is listed under "Ikeda Cove," "Ikeda Head" or "Jedway" in some issues of the *Monthly Record* and elsewhere) operated only from 1908 to 1920. The data seem remarkably variable, but investigation suggests that the Ikeda Bay data do seem to fit in with the general picture.

Ikeda Bay reported 42.48 inches of rainfall for November 1917, which is even more than Tasu Sound reported for October 1963. In November 1917, however, Swanson Bay, across Hecate Strait from Ikeda Bay, reported 87.56 inches of rainfall and three other stations on the east shore of Hecate Strait received over 20 inches of precipitation (*Monthly Record*). Thus the Ikeda Bay report for the month is not unreasonable. The contrast between the low rainfall in midsummer and the much higher rainfall later in the year that was noted for the other stations is also evident in the Ikeda Bay data (Figure 24). This contrast is here much less marked than at Tasu Sound, but it is considerably greater than at any of the other stations. The highest monthly rainfall for the period 1908-20 at Ikeda Bay was greater for most months of the year than the rainfall for the period 1947-63 at Langara, Masset, Tlell, Sandspit, or Cape St. James (tops of vertical lines, Figures 18 to 22 and 24).

The narrowness of Moresby Island and the lack of height of the interior uplands at the latitude of Ikeda Bay may mean that the rain shadow effect there is quite variable, and the station may also receive much precipitation on some occasions from a strong moisture-laden southeast flow of air from Queen Charlotte Sound. These factors, together with the hilly topography of the immediate vicinity, probably contribute to the great variability of precipitation at Ikeda Bay.

The air flow over Langara and Cape St. James is relatively unobstructed. These two stations are not sheltered from the moist air coming in from the ocean, and their annual precipitation is therefore greater than it is at Sandspit, Masset or Tlell, which are in the rain shadow of the Queen Charlotte mountains. On the other hand, as there is no pronounced orographic lift at Langara and Cape St. James, these localities receive much less precipitation than Tasu Sound or Ikeda Bay. The fact that precipitation is lighter at Cape St. James than at Langara probably reflects the greater influence of the North Pacific High and the lesser influence of the Aleutian Low at Cape St. James, which is farther south than Langara (Figures 4 and 5).

The decrease in precipitation from Tasu Sound to Ikeda Bay indicates that orographic lift is a less important factor at Ikeda Bay. The sheltering effect of the mountains is greatest at Tlell, which has the least rainfall. Sandspit, which is less well protected from the ocean than Tlell, receives more precipitation than Tlell. Masset, which is still more exposed and is farther from the influence of the North Pacific High in summer, receives more precipitation than Sandspit.

Queen Charlotte City is subjected to some orographic lift and to local intensification of precipitation from the moist airflow that follows the Skidegate Channel. It receives more precipitation than Masset but less than Ikeda Bay. The precipitation at Alliford Bay seems to be somewhat greater than at Queen Charlotte City but less than at Ikeda Bay. Dead Tree Point appears to be intermediate between Masset and Tlell in the amount of rainfall it receives.

Thunderstorms are rare on the Queen Charlotte Islands. At Masset and Langara, for example, the average number of days when thunder is heard is one day or less per year.

Snowfall

Coastal areas of the Queen Charlotte Islands average less than 30 inches of snowfall per year (Tables 6 and 7). This amount is much less than elsewhere in Canada, except for some other parts of the British Columbia coast and coastal islands and the northern Arctic islands. At Cape St. James the annual average is less than 10 inches and at Langara, Masset, Tlell and Sandspit it is between 20 and 30 inches. Average snowfall is probably around 25 inches at Tasu Sound.

The water equivalents of the average snowfall amounts (obtained by dividing the snowfall averages by 10) are rather insignificant in comparison with the average rainfall amounts (Table 2). Snowfall accounts for just over 1 percent of the average annual precipitation at Cape St. James and Tasu Sound, and for about 4 to 6 percent at the other stations.

Although winter precipitation is quite heavy on the Queen Charlotte Islands, the temperature, at least along the coast, is usually high enough to cause

precipitation as rain rather than snow. However, small differences in temperature can make the precipitation fall as rain one time and snow another, so the monthly snowfall amounts are quite variable. Often no snow falls at a station for several months during the winter and occasionally none may fall during an entire winter. In other places, with slightly lower temperatures, snowfall may be quite heavy (Table 6). For example, at Masset in January 1954, when the mean temperature was 4 degrees lower than the 17-year average for January, snowfall amounted to 40 inches, and a 15-inch fall was recorded for one day. Ikeda Bay reported 82 inches of snowfall in January 1916.

With the mild temperatures, frequent rains, and small amounts of snowfall that are usual along the coasts of the Queen Charlotte Islands, snow cover does not usually last very long. The average annual number of days when the depth of snow cover on the ground is an inch or more is 20 or less at most of these stations. This is much less than in most parts of Canada east of the British Columbia coastal area (Canada Department of Mines and Technical Surveys, 1957).

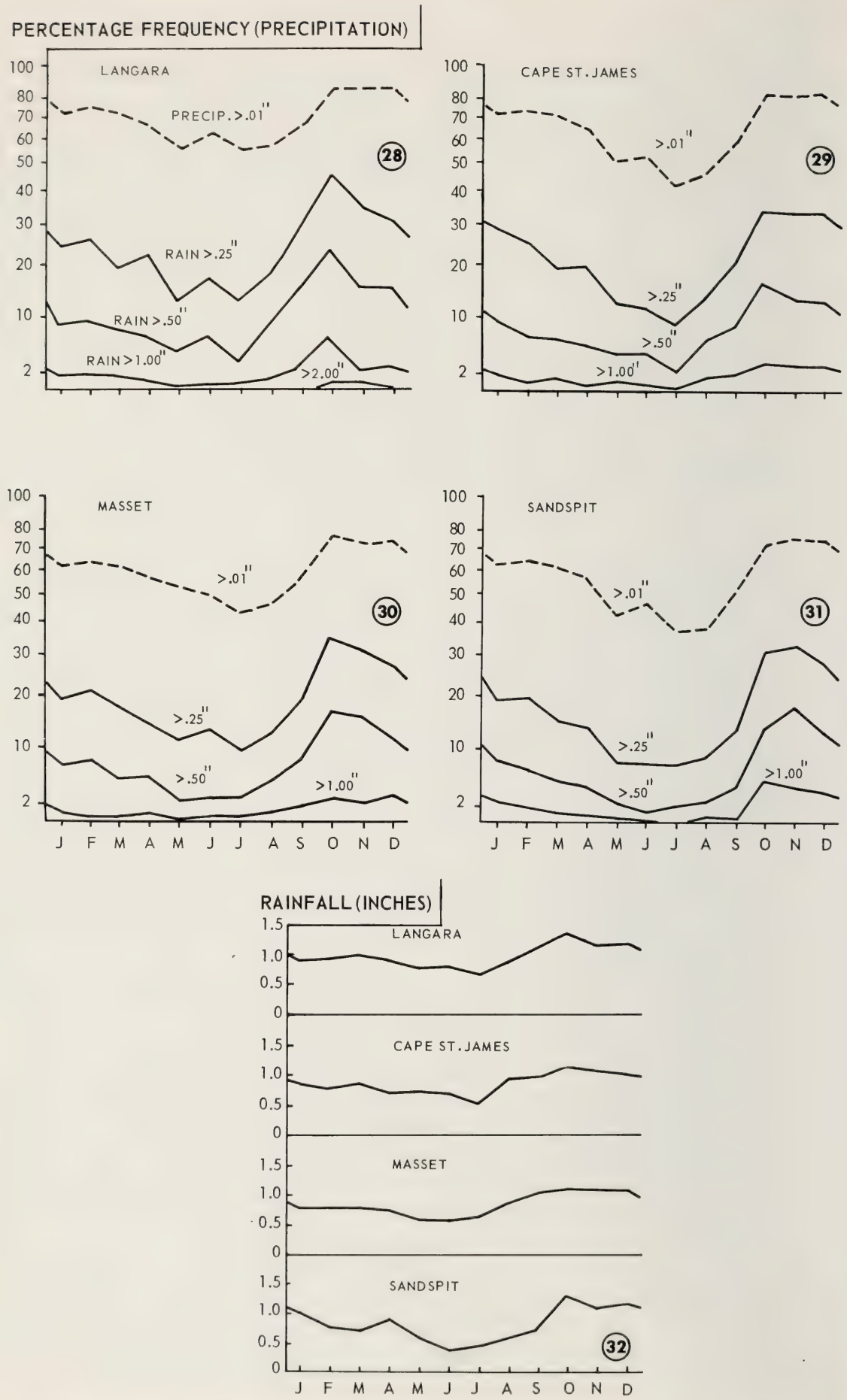
Precipitation Frequencies

The average number of days per year with measurable precipitation ranges from 205 at Sandspit to 249 at Langara (Table 2). Elsewhere in Canada, only some other parts of the British Columbia coast and islands and part of eastern Newfoundland have more than 200 days per year with measurable precipitation (Canada Department of Mines and Technical Surveys, 1957). Few other stations in Canada have as many days per year with measurable precipitation as Langara does. Tasu Sound does not seem to have any more days per year with measurable precipitation than Langara or Cape St. James (Table 8), so apparently the effect of orographic lift is to increase the amount rather than the frequency of precipitation.

At stations in the Queen Charlotte Islands, measurable precipitation occurs on two thirds to three quarters of the days from October to March, and even in July there is measurable rainfall on one third to one half of the days (Table 9; and dashed lines, Figures 28 to 31).

At Masset (Figure 30) the percentage of days with more than 0.25 inch of rain ranges from 10 percent in July to 34 percent in October. More than 0.50 inch of rain falls on 16 percent of October days, and more than 1 inch on 3 percent of all days in October and December. Percentages of days with rainfall greater than certain specified values are usually higher at Langara than at Masset. Such percentages are also generally higher at Cape St. James than at Sandspit. In July, the driest month, the percentages are lower at Cape St. James than at Langara. In October the percentages are also lower at Cape St. James than at Langara, but the percentages for the two stations during the winter and spring are quite similar.

The average heaviest 24-hour rainfall in a month (Figure 32) at Langara, Cape St. James, Masset, and Sandspit, ranges from about 0.4 inch in midsummer to 1.4 inches in the late fall. At Tasu Sound the 24-hour maximum rainfall may be 3 or 4 times as much as for the other stations, especially in the wetter months (Table 7).



Figures 28-32. Daily total precipitation and rainfall frequencies, and rainfall extremes, for Langara, Cape St. James, Masset, and Sandspit (see Table 4).

When Tasu Sound and Langara data were compared (Table 8), it was found that Tasu Sound usually had fewer days with measurable precipitation than Langara in the summer, but the reverse was more often the case in the winter.

Tasu Sound appears to have from 30 percent to 100 percent more days with over 0.25 inch of rainfall, and from 30 percent to 150 percent more days with over 0.50 inch, than Langara, except in midwinter when the data for the two stations are about the same. There are usually more days with over 1 inch of rain at Tasu Sound than there are with over ½ inch at Langara, and more days with over 3 inches at Tasu Sound than there are with over 1 inch at Langara.

Sunshine

Sandspit is the only station on the Queen Charlotte Islands from which records of the duration of bright sunshine are available, and these observations only began there in October 1954. The average annual number of hours of bright sunshine, based on records to the end of 1964, is 1,431 or about 32 percent of the astronomically possible hours. These values are more or less similar to those elsewhere along the British Columbia Coast, and in eastern Newfoundland and Labrador and parts of the eastern Arctic, but are much lower than in most other parts of Canada (Canada Department of Mines and Technical Surveys, 1957).

Table 8. Precipitation frequencies for weather stations on the Queen Charlotte Islands

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Number of days with precipitation												
1963												
Langara	—	21	14	16	18	18	13	9	26	28	26	21
Masset	—	21	10	8	18	21	15	2	24	24	18	14
Tlell	—	22	9	8	13	18	11	6	21	21	19	18
Sandspit	—	22	12	12	13	19	9	5	21	25	25	22
Cape St. James	—	23	17	20	15	21	16	7	23	29	26	25
Tasu Sound	—	23	20	20	16	20	10	4	26	29	28	24
1964												
Langara	28	24	28	24	18	17	25	22	18	25	—	—
Masset	21	18	13	17	16	14	21	16	12	22	—	—
Tlell	22	14	11	12	13	11	15	M	14	21	—	—
Sandspit	24	19	18	18	18	14	18	16	16	24	—	—
Cape St. James	29	24	25	20	17	15	16	22	15	25	—	—
Tasu Sound	29	24	22	19	15	11	20	21	18	25	—	—
Number of days with snow												
1963												
Langara	—	0	2	1	0	0	0	0	0	0	4	0
Masset	—	0	1	0	0	0	0	0	0	0	7	0
Tlell	—	0	0	0	0	0	0	0	0	0	4	0
Sandspit	—	1	1	1	0	0	0	0	0	0	6	0
Cape St. James	—	0	1	1	0	0	0	0	0	0	1	0
Tasu Sound	—	0	2	1	0	0	0	0	0	0	5	0
1964												
Langara	3	0	2	0	0	0	0	0	0	0	—	—
Masset	2	0	1	0	0	0	0	0	0	0	—	—
Tlell	2	0	0	0	0	0	0	0	0	0	—	—
Sandspit	3	1	2	2	1	0	0	0	0	0	—	—
Cape St. James	5	3	4	0	0	0	0	0	0	0	—	—
Tasu Sound	5	0	1	0	1	0	0	0	0	0	—	—

M indicates missing record.

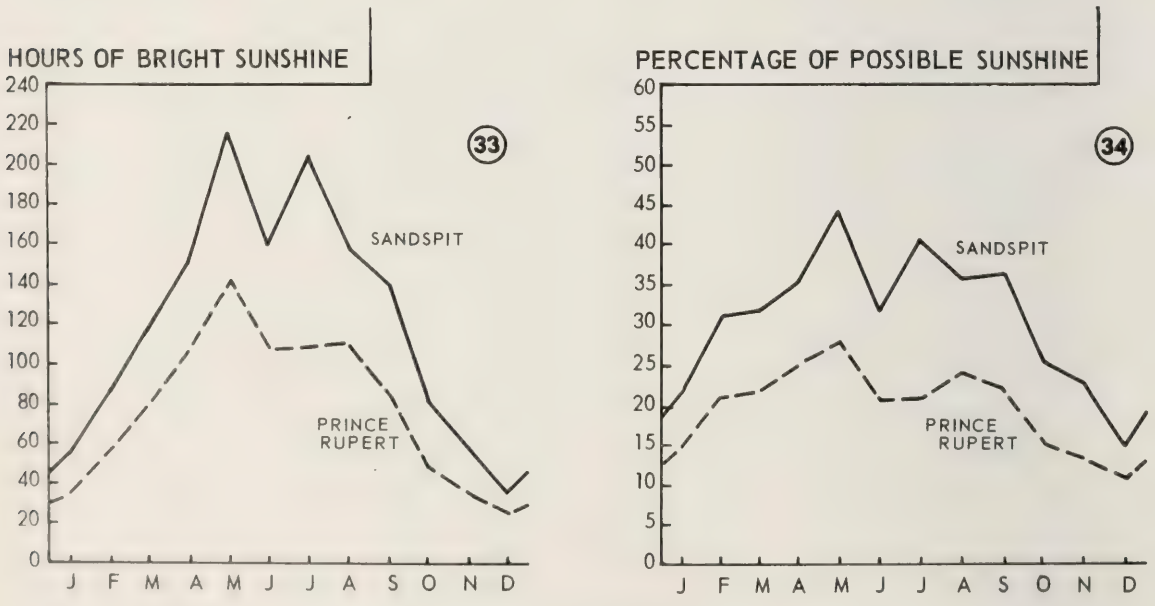
Table 9. Average number of days per month with measurable precipitation at Langara, Masset, Sandspit and Cape St. James (*see* Table 2)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Langara	21.7	20.5	21.8	19.6	17.2	18.5	16.9	17.8	19.7	25.9	24.5	25.3
Masset	19.2	17.8	18.8	16.7	16.2	14.8	13.1	13.9	16.4	22.9	21.5	22.7
Sandspit	19.3	18.1	19.0	16.8	13.1	13.9	11.4	11.9	14.9	22.1	22.2	22.6
Cape St. James	22.2	20.6	21.9	19.5	15.9	15.9	13.1	14.4	17.4	25.2	24.2	26.0

The average monthly duration of bright sunshine at Sandspit ranges from 36 hours in December to 205 hours in July, and 216 in May. These averages correspond to 15 percent of the possible hours of bright sunshine in December, 41 percent in July and 44 percent in May (Figures 33 and 34). A notable feature at Sandspit is the low average sunshine duration in June (159 hours or 31 percent), and the much higher May and July values. A related minor feature appears in the precipitation frequency data (Table 9), in which the average numbers of days with measurable precipitation in June at Langara, Sandspit and Cape St. James are somewhat higher in relation to the May and July averages than might have been expected.

The sunshine durations elsewhere on the east coast of the Queen Charlotte Islands from the northeastern tip southwards are probably similar to those at Sandspit.

Study of cloud data for British Columbia coastal stations shows that those stations which have northwestern exposures, such as Prince Rupert, Bull Harbour and Port Hardy, and Langara and Masset, tend to be cloudier than other stations, particularly during June and July. From records tabulated by Kendrew and Kerr (1955) it appears that Langara and Masset have cloudiness regimes



Figures 33-34. Average number of hours and percentages of possible hours of bright sunshine for Sandspit and Prince Rupert. (Sandspit data are based on the period November 1954 to December 1963 inclusive. Prince Rupert data are based on the period 1931-60.)

quite similar to those of Prince Rupert, and their average durations of bright sunshine are probably also similar to those at Prince Rupert.

At Prince Rupert the average annual number of hours of bright sunshine is 943. This is lower than the average for any other station in Canada from which sunshine records are available (Canada Department of Transport, Meteorological Branch, Climatology Division, 1964). The north end of the Queen Charlottes probably has only between 900 and 1,000 hours of bright sunshine per year, or about 20 percent of the possible hours.

At Prince Rupert percentages of possible hours of bright sunshine range from about 11 percent in December to 24 percent in August and 28 percent in May, with a June-July secondary minimum of 21 percent. The Prince Rupert average durations of bright sunshine, and the percentages of possible duration, are lower than the corresponding Sandspit values, particularly in the summer (Figures 33 and 34).

No records of either the duration of bright sunshine or cloudiness are available from the west side of the Islands. However, Calder and Taylor reported that there seemed to be a semipermanent cloud deck over the west side of the Islands, particularly along the central portion of the west side. This cloud canopy is also evident in several of the accompanying photographs (Figures 27, 35 and 36). Such reports seem to suggest that sunshine durations along much of the west side of the Queen Charlotte Islands may be at least as short as those at Prince Rupert, although they may increase toward the south end of the Islands.

While the duration of bright sunshine is low, even in summer, day length, which depends on latitude, is of course longer during the growing season on the Queen Charlotte Islands than at places in Canada that are farther south. On June 21 there are almost 17 hours of daylight at Sandspit.

Wind

Cape St. James is one of the windiest stations in Canada. The average annual wind speed during the period January 1953 to May 1964 was 21.2 mph. In *Climatic Summaries*, Vol. 2, "Humidity and Wind" (Canada Department of Transport, Meteorological Branch, 1959), the only station with a higher average wind was Grindstone Island, Quebec, with an average of 21.5 mph.

Air moving toward the British Columbia coast from the Pacific tends to be deflected as it approaches the coastal barriers and to move along the coast, resulting in a preponderance of southeast and northwest winds. The tendency for winds to come from the southeast is intensified in winter as the air moves counterclockwise around the Aleutian Low, while air moving clockwise around the North Pacific High increases the tendency for winds to blow from the northwest in summer. These effects are of course modified by local topography.

At Cape St. James (Table 10) average wind speeds range from about 26 mph in December to 16 mph in August. Conditions are calm only about 1 percent of the time in the summer and less often in the winter. The wind comes from the northwest over 40 percent of the time during the summer. Southeast to south winds tend to be most frequent in the fall and winter, although winds from the northeast, northwest and west are also common. The southeast winds are strongest in all months except July, when northwest winds are strongest.

Figure 35. Looking north-northwest over Kunghit Island from Cape St. James climatological station. (Photograph courtesy of Canada Department of Transport, Meteorological Branch.)



Figure 36. Looking north-northeast over Kunghit Island from Cape St. James climatological station. (Photograph courtesy of Canada Department of Transport, Meteorological Branch.)

Langara is also a very windy station. Kendrew and Kerr (1955), quoting eye-observation data (data estimated without instruments) for 1941-51 at Langara, state that in January, winds are in the 13 to 38 mph range 50 percent of the time and exceed 38 mph 3 percent of the time and gales from the east and southeast are frequent in the winter. In July, winds are in the 13 to 38 mph range

Table 10. Percentage frequencies and average speeds by direction of wind at Cape St. James and Sandspit

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Cape St. James (Jan. 1953-May 1964)													
Percentage frequency													
N	8	11	8	7	8	7	4	3	6	5	6	6	7
NE	18	15	11	11	6	5	3	5	8	11	11	12	10
E	4	4	4	3	4	3	2	2	2	3	3	4	3
SE	18	15	15	14	15	12	6	8	12	18	23	23	15
S	16	13	15	14	14	14	9	11	13	18	17	18	14
SW	10	11	11	10	8	9	7	8	12	14	13	11	10
W	13	13	15	13	14	16	19	18	16	15	14	12	15
NW	13	18	21	27	30	33	49	44	30	16	13	14	25
Calm	*	*	*	1	1	1	1	1	1	*	*	*	1
Average wind speed (mph) by direction													
N	12.5	17.9	12.4	13.5	16.1	17.1	15.1	8.6	12.1	10.8	12.2	11.4	—
NE	19.8	23.0	17.8	15.8	14.0	9.9	9.3	10.1	12.4	14.9	16.4	19.2	—
E	22.1	23.8	23.4	17.3	18.2	15.4	17.2	11.4	16.2	19.7	20.9	29.0	—
SE	32.7	31.5	26,8	29.4	21.2	20.9	18.2	16.9	22.6	30.1	29.9	32.2	—
S	28.1	26.7	25.1	26.4	20.2	17.2	14.6	16.2	19.5	25.0	26.2	29.8	—
SW	27.7	25.9	23.7	25.4	15.5	15.8	13.3	16.4	19.2	27.5	25.8	26.4	—
W	24.8	26.6	24.1	26.1	16.4	16.5	16.8	16.0	17.7	21.5	26.3	26.3	—
NW	21.0	24.9	23.1	23.2	19.3	20.4	22.1	16.5	16.7	17.7	19.7	22.8	—
Average speed (mph)	24.5	23.0	22.1	23.4	18.1	17.8	18.6	16.3	17.4	22.2	23.9	26.1	21.2
Sandspit (Jan. 1955-Apr. 1964)													
Percentage frequency													
N	4	5	5	5	5	4	5	4	5	3	2	2	4
NE	2	2	3	2	3	3	4	4	3	2	1	2	3
E	5	5	7	5	8	9	10	7	4	4	3	5	6
SE	30	29	26	26	27	29	19	22	24	36	35	34	28
S	9	8	7	7	4	3	2	5	7	12	13	11	7
SW	11	15	13	14	10	12	12	13	13	14	13	12	13
W	13	12	15	21	21	19	24	18	18	11	9	13	16
NW	13	13	10	8	7	7	7	8	9	6	11	9	9
Calm	13	11	14	12	15	14	17	19	17	12	13	12	14
Average wind speed (mph) by direction													
N	5.4	7.6	5.9	4.6	4.0	2.9	4.4	3.2	5.2	2.5	2.2	3.9	—
NE	3.6	3.2	3.5	1.6	1.9	2.3	2.8	2.0	1.7	2.6	0.8	2.7	—
E	9.6	9.1	10.8	5.3	1.9	8.2	8.0	5.6	3.7	6.9	4.5	10.5	—
SE	53.2	43.2	38.4	40.0	38.1	41.0	21.2	24.8	30.2	49.2	54.8	56.9	—
S	6.3	5.3	4.4	5.1	2.6	1.7	1.0	2.6	3.9	7.3	8.8	7.9	—
SW	8.8	13.6	10.3	12.7	7.1	9.3	9.0	9.2	8.5	10.6	11.6	9.5	—
W	10.0	11.5	12.5	18.1	16.1	16.4	20.7	13.5	14.3	9.0	7.7	11.1	—
NW	16.4	17.9	14.0	9.7	7.1	6.2	7.3	7.1	10.7	7.3	15.9	12.4	—
Average speed (mph)	13.4	11.1	10.0	9.7	8.6	8.8	7.4	6.8	7.8	9.6	10.6	11.5	9.7

*Indicates less than 0.5%

32 percent of the time and exceed 38 mph 1 percent of the time. Conditions are calm for about 1 percent of the time in January and 7 percent in July.

In January at Langara, winds blow from the east, southeast, south, or southwest 70 percent of the time, with southeast winds predominating. In July the wind is from the south, southwest, west, or northwest 73 percent of the time, with south and southwest winds predominating.

The average speed of southeast winds is very high at Sandspit (Table 10), because of the funneling effect of Hecate Strait, which is wide at the south and narrow at the north end. Winds at Sandspit are southeasterly for about a third of the time in fall and winter and about a fifth to a quarter of the time in summer. The average speed of southeast winds ranges from 57 mph in December to 21 mph in July. The average southeast winds at Sandspit are stronger than the average winds from any direction at Cape St. James, except in July, when the northwest winds at Cape St. James are slightly stronger than the southeast winds at Sandspit. Westerly winds are fairly common at Sandspit in summer, and in July they are somewhat more frequent and almost as strong as the southeast winds. The west winds at Sandspit probably reflect the east-west orientation of the Skidegate Channel to the west of the station.

Table 11. Average monthly percent relative humidity at Alliford Bay, Cape St. James, Langara, and Masset*

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Alliford Bay												
1941-45.....	95	93	91	87	84	82	83	84	84	94	96	98
Cape St. James												
1945-50.....	92	91	90	88	90	92	92	91	90	91	92	92
Langara												
1941-50.....	92	93	90	90	91	94	94	94	94	92	93	93
Masset												
1944-49.....	94	92	90	86	83	84	86	85	89	90	92	95

*Adapted from *Climatic Summaries for Selected Meteorological Stations in Canada*, Volume 2 (revised), Canada Department of Transport, Meteorological Branch.

Except for the southeasterlies throughout the year and the westerlies in the summer, average winds from most directions at Sandspit are much lighter than at Cape St. James. The average Sandspit wind speeds from all directions taken together are generally less than half the speeds at Cape St. James. The percentages of occurrence of calms range from 10 to 20 at Sandspit, in contrast with 1 or less of calms at Cape St. James.

Wind speeds of 13 mph or greater occur only about half as often at Dead Tree Point as at Langara (Kendrew and Kerr, 1955). Southeasterlies predominate throughout the year, and calm prevails between 20 and 30 percent of the time.

Winds along the west sides of the Islands are probably rather similar to those at Cape St. James, although there would be many areas of local variation

caused by topographic features. Along the east side there are probably variations of the type of wind regime represented by Sandspit, with strong southeasterlies but light winds from other directions.

The maximum hourly wind speed observed both at Cape St. James in the period 1952-59 and at Sandspit in the period 1955-59 was 80 mph. With such an hourly wind it is estimated that gusts of up to 123 mph could occur (Canada Department of Transport, Meteorological Branch, 1959). On a map of computed maximum gust speeds (which did not take tornadoes into account) the Queen Charlotte Islands and the Gulf of St. Lawrence were shown to be the only areas of Canada with computed maximum gusts of over 120 mph. The probability of occurrence of destructive winds (excluding tornadoes) is thus greater on the Queen Charlotte Islands than in most other parts of Canada.

Humidity

Evaporation from the ocean provides an abundant source of atmospheric moisture for the air masses that move over the Queen Charlotte Islands. This moisture, together with the prevalence of cloudy days, and the rareness of hot sunny weather in summer contributes to the unusually high relative humidity on the Queen Charlotte Islands.

At Langara the average monthly relative humidity is 94 percent in the summer and slightly less in other seasons, and at Cape St. James it is 90 percent or higher in every month except April. At less exposed locations it drops to the low eighties in summer (Table 11).

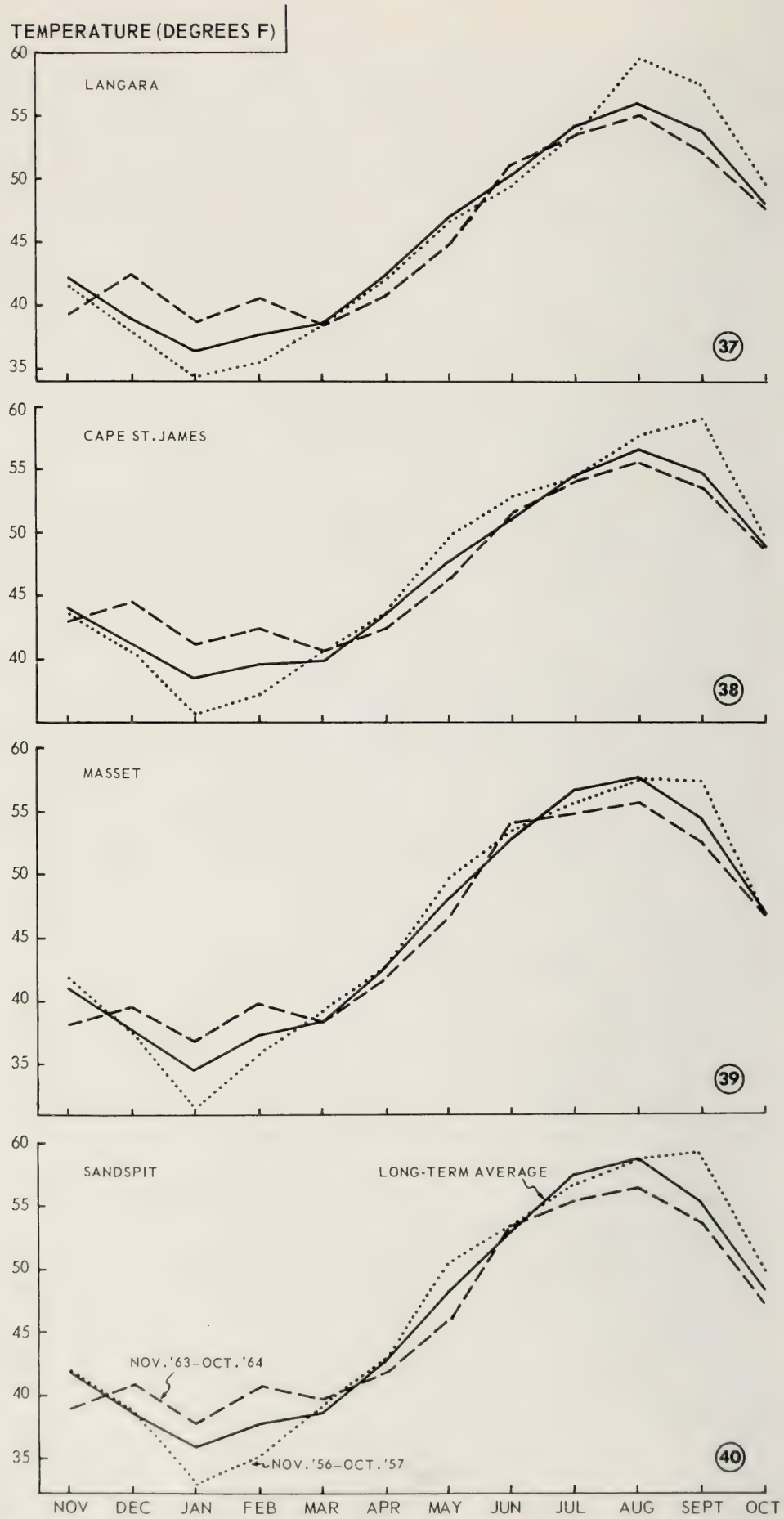
Elsewhere in Canada only a few coastal stations have average July relative humidities above 90 percent, and at most inland locations the July averages are under 75 percent (Canada Department of Transport, Meteorological Branch, 1959).

The Climate of the Interior

Most of the land on Graham Island to the northeast of a line through Dead Tree Point and Langara is rather low lying, with elevations ranging from sea level to about 500 feet. This whole area is influenced by the presence of the barrier of mountains to the west and is probably reasonably well represented by the climatological stations at Masset and Tlell. At points some distance from the water, diurnal temperature ranges would be greater, frost-free periods shorter and frequencies of minimum temperatures below various levels probably greater than at the east or north coasts. Wind speeds would probably be lower over most of this area than at Langara or Sandspit.

The remainder of the interior, that is, south and southwest of a line through Dead Tree Point and Langara, is extremely rugged. The elevation of much of it is from 1,000 to 2,000 feet and some peaks rise to 3,000 or 4,000 feet. There are no climatological stations in this area, and it would be difficult to find locations in the area where "representative" records could be obtained in view of the great variability of local climate in such terrain.

In general, temperatures decrease about 3°F for each thousand-foot increase of elevation. At elevations of 1,500 feet, for example, annual temperatures would be about 41°F; monthly mean temperatures would average about 52° in



Figures 37-40. Monthly mean temperatures of the 1957 and 1964 growing seasons and preceding winters at Langara, Cape St. James, Masset, and Sandspit compared with long-term averages.

midsummer and about 30°F in winter. The average ranges between daily maximum and minimum temperatures would be greater at this elevation than at Masset, which has the greatest ranges of any of the stations used in this study. Frost-free periods in the interior would be much shorter than at lower levels.

In such terrain precipitation tends to increase with height. One reference (Berry and others, 1945) suggests the formula $r_h = r_o + 0.072h$, where r_h is precipitation at height h (feet) above the base of the mountain and r_o is precipitation at the base of the mountain. If this formula is applied to the estimated Tasu Sound annual precipitation to determine likely precipitation on Red Top Mountain, which is 3,245 feet high and is east of Tasu Sound, the following result is obtained:

$$r_h = 196 + 0.072\,(3245 - 18) = 428 \text{ inches of average precipitation.}$$

At 1,000 to 2,000 feet on the western slopes the estimated average precipitation is from 260 to 340 inches annually. Precipitation would be expected to decrease rather abruptly east of the height of land, with locations at elevations between 1,000 and 2,000 feet on the eastern slopes receiving less than 200 inches of precipitation annually, and perhaps less than 100 inches over much of the area of the eastern slopes.

While winter precipitation on the Queen Charlottes is quite heavy, temperatures near sea level are mild enough for most of it to fall as rain. With temperatures 3 to 6°F colder, which would prevail at elevations from 1,000 to 2,000 feet, it seems likely that a much larger proportion of the winter precipitation would fall as snow. In some winters, at least, snowfall amounts of at least 3 or 4 feet per month could occur at the higher elevations, and there would be deep and long-lasting snow cover.

Average temperatures at elevations of 3,000 feet or more would probably be cold enough to make most of the winter precipitation fall as snow, even in rather mild winters, and the heavier the total precipitation as measured at sea level, the heavier the snowfall would be in the mountains. At low elevations, where most of the winter precipitation normally falls as rain, the amount of winter snowfall would depend more on the temperature than on the amount of total precipitation. The snowfall at low elevations would tend to be above average in a very cold winter, even if the total precipitation were below average.

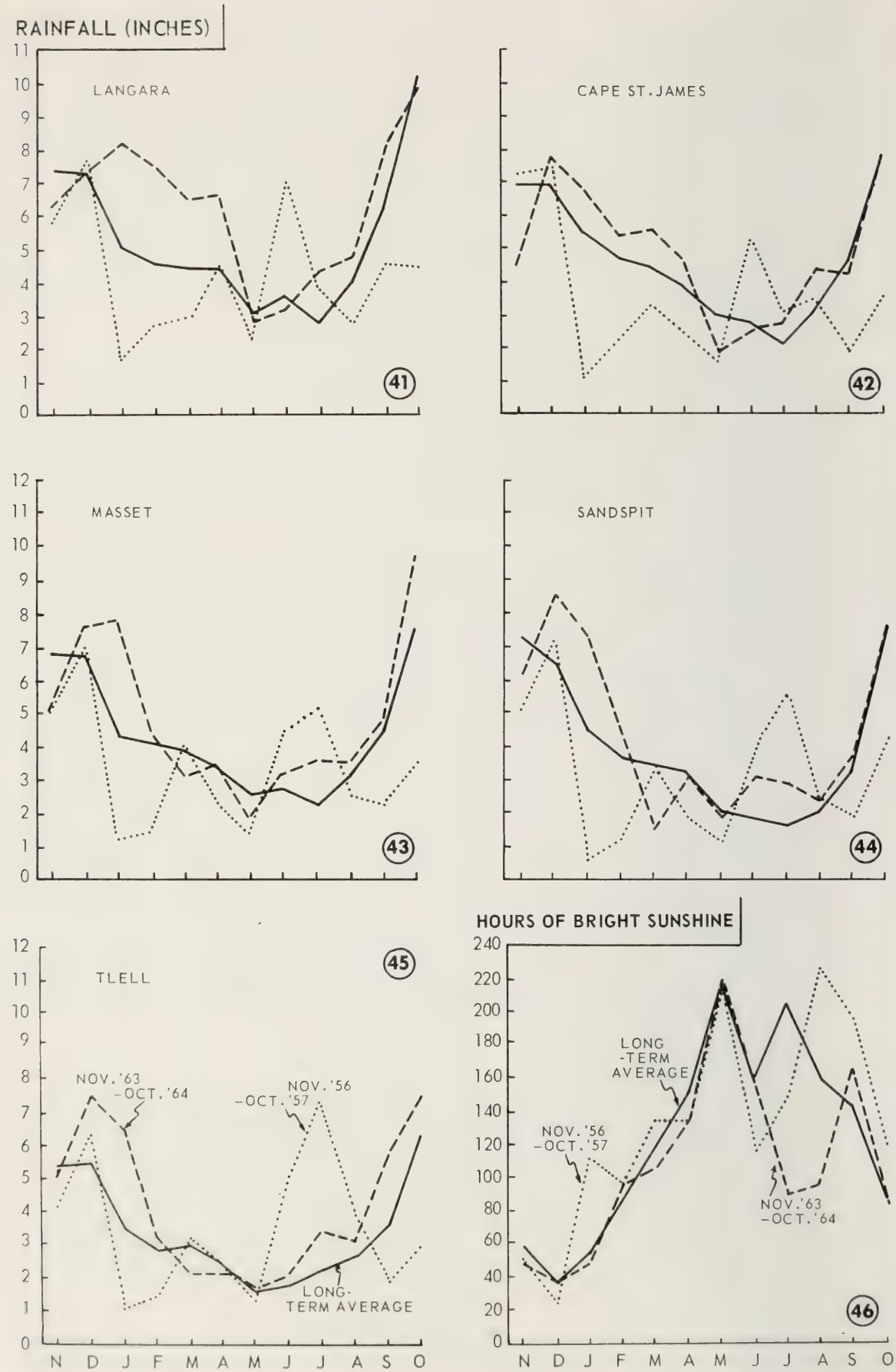
Wind speeds on exposed western slopes would probably be even stronger than those at Cape St. James.

Climatic Classification

In Canada the most widely accepted system of climatic classification is the Köppen system. The categories in this system are quite broad and three of the categories (Dfb, Dfc and ET) cover 94 percent of the area of Canada.

The humid, temperate climate with mild winters and cool summers, as indicated by the available data from climatological stations on the Queen Charlotte Islands, is classified as Cfb. This type occupies less than 1 percent of Canada, where it is found only in British Columbia, and there chiefly within 50 miles of the Pacific Ocean.

If routine climatic data were available from the interior they would probably show that some parts of the Queen Charlotte Islands should be classified as the



Figures 41-46. Rainfall amounts and sunshine durations of the 1957 and 1964 growing seasons and preceding winters compared with long-term averages.

Cfc type. This type is not shown anywhere in Canada (Canada Department of Mines and Technical Surveys, 1957), but it occurs elsewhere in the world in such places as the Aleutian Islands and southern Iceland.

The 1957 and 1964 Growing Seasons and Preceding Winters

The 1957 and 1964 seasons are of particular interest because the plant surveys by Calder and Taylor were carried out in those years.

At stations on the Queen Charlotte Islands in 1957, September was 3 to 4°F warmer than the long-term averages, and temperatures were also near or above average for most of the spring and summer months except July, which was generally cool. The preceding winter was mainly colder than average, especially in January (Figures 37 to 40).

June and July were quite cloudy and rainy in 1957, but spring, fall and the preceding winter were rather dry, particularly the months of January and February (Figures 41 to 46). At Sandspit, Tlell and Masset in 1957, July was wetter than October. This is quite unusual for the Queen Charlotte Islands.

In 1964 the monthly mean temperatures were below the long-term averages from April to October, except in June when they were slightly above average. The preceding winter was warmer than usual (Figures 37 to 40).

May rainfall was near or below average in 1964, but most of the rest of the season was somewhat wetter than average, particularly July and August, which were unusually cloudy. Rainfall during the preceding winter was also considerably above average, particularly in December 1963 and January 1964 (Figures 41 to 46, also Table 7).

Calder and Taylor have reported that in the summer of 1964 there was deep snow on the ground at the 3,000- to 3,500-foot levels, which probably remained there all summer, and that there was some snow down as far as the 2,000-foot level in the early summer. From conversations with local residents it appeared that it was very unusual for snow to remain so long or at such low elevations as it did in 1964.

The November 1963 snowfall was more than six times the long-term average for November at Masset, Langara, and Tlell (Table 7). For comparison, at Masset, which received 15½ inches that month, the previous record snowfall for November was 15 inches in 1903 and 1911. A much larger proportion of the November 1963 precipitation would have fallen as snow in the interior uplands than along the coast.

At sea level the winter of 1963-64 was generally milder and wetter than usual, and monthly mean temperatures were all above 36°F. At 3,000 feet, however, monthly mean temperatures would probably have been 32°F or lower from November 1963 to March 1964. At such heights it seems likely that the accumulation of snow began in November and continued, without depletion, by melting throughout the winter, and that most of the above-normal precipitation of that winter fell as snow. The resulting very deep snow cover would take a long time to melt. This would seem to be the logical explanation of the deep snow which Calder and Taylor encountered in the mountains in the summer of 1964.

In the winter of 1956-57, January and February were considerably colder than average. However, the precipitation of that winter was light; January 1957 was particularly sunny and dry. Heavy snow cover would not be expected in the mountains in the spring of 1957. Calder and Taylor have reported that the snow was nearly all gone from the mountains by early summer that year.

Summary

The main distinguishing features of the climate of the Queen Charlotte Islands are the very cool summers, the very mild winters, the prevalence of cloudy skies and strong winds, and the excessive late fall and early winter rainfall. This heavy seasonal precipitation is most intense on the west side of the Islands, and it is due to the orographic effect.

Annual precipitation probably exceeds 40 or 50 inches over most parts of the Islands, and 200 to 300 inches on some of the western slopes. Much of the winter precipitation in the mountains falls as snow. In some winters this snow may accumulate to depths of many feet and may last well into the summer at altitudes of 2,000 feet or more.

Day lengths are long during the growing season but the durations of bright sunshine are among the lowest in Canada. Near sea level, average temperatures are below 60°F in the warmest month but are above freezing in the coldest month, and average frost-free periods range from nearly 160 days at Masset to over 260 days at Cape St. James.

It is unfortunate that so little climatological data is available from the west side of the Islands, and that none is available from the interior. If some additional climatological stations could be established at strategic locations on the Islands, a few years of observations from such stations would greatly improve our understanding of the very interesting, and, for Canada, very unusual climate of the Queen Charlotte Islands.

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Economic Botany

The economy of the Queen Charlotte Islands is based on the two chief industries, lumbering and fishing. Mining has played a minor role in the development of the Islands' economy but the high price of base metals in recent years has spurred geological exploration. Open-pit iron mines are now operating near the head of Harriet Harbour and iron deposits are being developed in Tasu Sound. Agriculture as an industry is almost nonexistent. There are a few farms, but in most instances additional work in either lumbering or some other enterprise supplements the farm income. Lumbering and fishing are the main sources of income and most wage earners on the Islands are employed in these industries.

FORESTRY

Logging is the main industry of the Queen Charlotte Islands. There are two large tree-farm licences, one operated by MacMillan, Bloedel and Powell River Ltd. out of Juskatla and the other by Rayonier Canada (B.C.) Ltd. from Moresby Logging Camp. They contain about 600,000 productive acres with a total mature volume of just over 2 billion cubic feet. In addition to these two licences there are public sustained-yield units that are being logged by smaller operators. Present logging practices have been designed on a perpetual yield basis. Selective cutting, large-scale reforestation programs utilizing selected seed or seedlings, and the use of herbicide sprays for eliminating alder and other aggressive competitors are part of normal logging operations on the Islands. The general forest management practices we have observed are a credit to both the British Columbia Forest Service and the logging companies.

The Queen Charlotte Islands have long been known as a primary source of Sitka spruce. During the First and Second World Wars there was a strong demand for airplane spruce and many millions of board feet were shipped to aircraft manufacturers in Canada and the United States. Although Sitka spruce is the most valuable forest tree it does not constitute a large proportion of the total forest on the Islands (see discussion under Forest Communities, p. 82). Forestry personnel at Juskatla estimate that the forest community in their tree-farm licence is comprised of approximately 50 percent western hemlock, 40 percent western red cedar with minor amounts of yellow cedar, and 10 percent Sitka spruce. The practice of consistent reforestation with Sitka spruce will greatly increase the proportion of this tree in years to come. Figures for the total cubic feet cut for the various forest species in the coastal area of the Prince Rupert forest district (which includes the Queen Charlotte Islands) are listed in the 1964 annual report of the British Columbia Forest Service: cedar (*Thuja plicata*), 17,785,356; spruce (*Picea sitchensis*), 20,896,871; hemlock (mostly

Tsuga heterophylla), 42,704,651; cypress (*Chamaecyparis nootkatensis*), 394,385; and lodgepole pine (*Pinus contorta*), 17,232.

AGRICULTURE

Since the late 1800's there have been repeated attempts to establish farming communities on the Queen Charlotte Islands. By 1908 (McKay, 1953) there were about 50 settlers in the Lawnhill—Millar Creek area along the east coast of Graham Island; in the Report of the Minister of Lands for 1912 it is stated that there were nearly 100 people living along the north coast of the Island between Masset and Rose Spit. The homesteads of these early settlers were abandoned many years ago, but their attempts at farming are still evident, especially along the coastal road between Skidegate and Tlell. Over the years, numerous other attempts were made to establish communities that would be in part agriculturally self-supporting, but all have failed.

Today the agricultural activity is restricted to a few small farms and market gardens in the eastern section of Graham Island at Masset, Port Clements, Tlell and Queen Charlotte City, and in the northeastern section of Moresby Island in the vicinity of Sandspit. Only two farms are operated as full-time occupations by their owners; one is mainly for beef production, and the other is a dairy operation, which helps supply the local needs of Sandspit. Grazing and the production of a major portion of the hay crop is carried out on local acreage, but feed grain is imported to supplement local needs. The few small gardens producing marketable vegetables and fruits have experienced limited success, only after adequate care was taken to prepare a proper soil bed and to provide good drainage. The extensive lowland bogs of northeastern Graham Island have often been proposed as a major agricultural area, but it is generally believed that until careful soil and drainage surveys are completed, and horticultural experiments have been carried out, no further efforts should be made to farm this land.

There is little likelihood that agriculture will ever play an important role in the economy of the Islands. The western section with its mountainous terrain, high rainfall and poor soils has little potential; and in the eastern section, the acreage of suitable arable land is very limited.

CULTIVATED TREES AND SHRUBS

During the 1964 survey of the Islands, Mr. L. C. Sherk of the Plant Research Institute conducted a brief survey of the cultivated trees and shrubs grown in gardens at Masset, Haida, Port Clements, Skidegate, Skidegate Village, Queen Charlotte City and Sandspit. There are a few gardens with extensive displays of flowering shrubs, but most residents have devoted their garden space to a limited number of annuals and perennials. Most garden trees and shrubs are the standard hardy species grown throughout most of Canada. The most frequently encountered trees are box-elder (*Acer negundo*), Norway maple (*Acer platanoides*), horse-chestnut (*Aesculus hippocastanum*), birch (*Betula* spp.), hawthorn (*Cra-*

taegus monogyna), European beech (*Fagus sylvatica*), ash (*Fraxinus* sp.), flowering crabapples (*Pyrus* spp.), Japanese flowering cherry (*Prunus serrulata*), Higan cherry (*Prunus subhirtella*), weeping willow (*Salix alba* var. *tristis*) and European mountain-ash (*Sorbus aucuparia*). One depauperate specimen of tulip tree (*Liriodendron tulipifera*) was noted and its poor growth may be due to the wet climate.

A few trees native to mainland British Columbia are seen in gardens, for example, vine maple (*Acer circinatum*), Oregon maple (*Acer macrophyllum*), flowering dogwood (*Cornus nuttallii*), black cottonwood (*Populus trichocarpa*), Garry oak (*Quercus garryana*) and cascara (*Rhamnus purshiana*). The more frequently encountered shrubs are: Japanese barberry (*Berberis thunbergii*), butterflybush (*Buddleia davidii*), Siberian peashrub (*Caragana arborescens*), *Cotoneaster horizontalis*, *Forsythia* sp., *Hydrangea macrophylla*, juniper (*Juniperus* sp.), *Kerria japonica*, *Laburnum* sp., privet (*Ligustrum* sp.), honeysuckle (*Lonicera* sp.), mock-orange (*Philadelphus* sp.), Mugho pine (*Pinus mugo* var. *mughus*), rhododendron (older, more hardy types), roses (*Rosa* spp.), willows (*Salix* spp.), *Spiraea* × *vanhouttei*, French lilac (*Syringa vulgaris*), *Weigela* sp., *Viburnum carlesii* and European high bush-cranberry (*Viburnum opulus*). Two native shrubs of British Columbia, winter currant (*Ribes sanguineum*) and red-osier dogwood (*Cornus stolonifera*), are occasionally used in gardens.

There are a few unusually tender shrubs and trees. Of particular interest are: English box (*Buxus sempervirens*), Lawson cypress (*Chamaecyparis lawsoniana*), Scotch broom (*Cytisus scoparius*), English holly (*Ilex aquifolium*), privet honeysuckle (*Lonicera pileata*), common cherry-laurel (*Prunus laurocerasus*), redwood (*Sequoia sempervirens*) and gorse (*Ulex europaeus*).

Plant Communities

The problem of adequately defining and describing plant communities is always beset with numerous pitfalls. We have found no simple answer to the problem of clearly defining the plant communities on the Queen Charlotte Islands. During the course of two summers on the Islands, we systematically attempted to circumscribe a particular plant community by making transects through it and recording the major vegetation types, describing the topographic features, and noting the occurrence and relative abundance of the plant species in the community. A portable tape recorder was found to be a most useful tool in recording the observations. Our results are discussed under each respective plant community and represent impressions and observations recorded in the field.

This method of presentation can be criticized as purely descriptive, with little emphasis on considerations that would appeal to an ecologist interested in a more detailed and well-documented presentation, including soil types and their analysis, micro- and macro-climatic conditions, vegetational zones and layering, and various physiological factors affecting the growth and development of plant members of the community. We had to restrict our presentation of plant communities to the more classical descriptive type because the first task during our summer surveys was to assess the systematics and distribution of the plant taxa found on the Islands.

The descriptions on the following pages cover a cross section of the major plant communities on the Islands, and some minor communities of unusual interest with respect to plant distributional problems bearing on the occurrence of certain taxa on the Queen Charlottes. The general arrangement is similar to that found in *The Vegetation of Scotland*, a well-documented work edited by J. H. Burnett in 1964.

MARITIME COMMUNITIES

A detailed discussion of maritime communities is important in an insular flora. The rugged topography of much of the Queen Charlotte Islands is evident in the highly dissected coastlines of Moresby Island and western Graham Island. On both the west and east coasts of Moresby Island there are numerous fjords and inlets and prominent rocky headlands. Many small and large islands occur along the east coast of Moresby Island south of Cumshewa Inlet, but there are few along the more rugged exposed west coast. Coastal environments along the west side of the Islands are strongly influenced by severe weather. In addition, the nature of the topography and geology limit the formation of extensive sand beaches. The inaccessibility of long stretches of the west coast because of adverse sea and weather conditions seriously hampered our studies in this region.

The east coast of Moresby Island also is essentially devoid of sand beaches, but along the north and east coasts of Graham Island sand and shingle beaches extend for many miles. There are a few conspicuous crescent sand beaches such as the one at Lepas Bay, near the northwestern tip of the Island on the west coast. The relatively low rainfall along the east and part of the north coast of Graham Island, coupled with less severe winter conditions, provides a coastal environment in which a number of species of generally more southern distribution are found. The diversity in coastal habitats is considerably greater along the east coast of the Islands. It is this region, and especially those areas that are protected such as sheltered harbors and the heads of inlets, that will usually be referred to in the discussion of maritime communities.

It has been hard to find adequate terminology for the various beach zones but we finally decided to use the following in our descriptions: foreshore, that part of the beach that is subject to tidal action; driftwood zone, that part of the beach immediately above the foreshore that contains logs and other flotsam; transition zone, that region of the beach that extends from the uppermost part of the foreshore to the forest margin, or if a driftwood zone is present, from this zone to the forest margin.

Shingle Beaches

The shingle beach communities represent a considerable portion of the beaches found on the Islands. Two types may be distinguished: those that are influenced by strong wave action and exposed to the open sea, and those that are found in the more protected inlets and are affected mainly by tides and gentle wave action.

Beach communities much influenced by wave action

The lower part of the beaches in these communities is strongly affected by wave action, and in addition to coarse gravel there are at times many boulders in the foreshore (Figure 47). The upper beach zones often show the effect of wind action. An extensive driftwood zone is found at the limit of the upper tidal zone and often there are sand blowouts between the driftwood and the forest margin. Where there are large spits, such as at Masset, tidal lagoons or partially enclosed embayments may be formed by the shifting reticula of gravel and sand. There are numerous examples of this type of community between Skidegate Village and Lawn Point, and there are prominent gravel spits at Masset, Sandspit and Rose Point.

Jungle Beach This site is characteristic of the highly eroded shorelines along the southern portion of the east coast of Graham Island. The beach consists of tide-washed coarse gravel with occasional boulders up to the driftwood zone. Isolated plants of *Atriplex patula*, *Arenaria peploides*, *Mertensia maritima* and *Cakile edentula* occur immediately in front of and in the loose driftwood at the top of the beach. On the shore side in the more stabilized portion of the driftwood zone *Elymus mollis*, *Lathyrus japonicus* and *Vicia gigantea* occur abun-



Figure 47. Shingle beach at low tide just south of Sandspit along the northeast tip of Moresby Island.

dantly. The margin of the spruce-hemlock woods borders the driftwood zone, and in the transitional belt, *Conioselinum pacificum*, *Gaultheria shallon* and a number of weedy species are the dominant elements. The occurrence of the weedy species is undoubtedly due to the presence of the nearby coastal road, which is bordered by many adventives. Other species that often occur in the upper part of these beach communities are *Fragaria chiloensis*, *Ligusticum scoticum*, *Trifolium wormskjoldii*, *Stellaria media*, and *Galium aparine*. The sparse distribution of almost all species in the driftwood zone undoubtedly reflects the unstable nature of the community, which is frequently modified by severe southeastern storms.

Spits at Masset and Sandspit These large and extensive gravel and sand spits have a similar flora to that of Jungle Beach in and below the driftwood zone. However, the extensive gravel zone behind the driftwood provides many additional microhabitats for species of restricted distribution on the Islands. Both these sites have been used as grazing areas for local cattle herds and have extensive weedy ground covers. At Sandspit the Department of Transport has located an airstrip on the spit and the *Lolium perenne* that was introduced to prevent wind erosion is now one of the dominant grasses in this region. There are a large number of weed records from Sandspit and this is apparently the only station where many weedy species occur on the Islands. The expansive stabilized gravel flats at the base of Masset Spit are the site for such indigenous species as *Botrychium lunaria*, *Castilleja hyetophila* and a number of annual introduced grasses.



Figure 48. Protected shingle beach in Kootenay Inlet on west coast of Moresby Island with *Fucus* in lower tidal zone bordered by grasses and sedges in upper tidal zone.

Beaches affected by tidal action only

At the head of inlets and along the margins of protected bays there are often relatively stable shingle beaches. The foreshore has a gradual succession of narrow zones beginning with an extensive submerged *Zostera marina* zone and an intertidal region covered with *Fucus*. Above the *Fucus* band some rather distinct stands of vascular plants occur. At Kootenay Inlet (Figure 48) the following zones were observed: *Puccinellia pumila*, *Cochlearia officinalis*, *Spergularia canadensis*, *Atriplex patula*, *Sagina maxima* and *Plantago maritima* occur just above the extensive *Fucus* band. The latter two species are most abundant on rock sills that jut out on to the beach. This zone is almost always inundated during high tides. *Glaux maritima*, *Salicornia pacifica* and *Triglochin maritimum* often occur in this zone.

The main components of the upper zone that is occasionally covered during high tides are: *Deschampsia caespitosa*, *Carex lyngbyei*, *Festuca rubra*, *Agrostis exarata* and *Hordeum brachyantherum*. These plants provide the first discernible and conspicuous green band of the beach.

Above the normal high tide zone, but in an area that may be covered during exceptionally high tides, a composite zone of plants borders the adjacent forest region. Its primary constituents are: *Galium trifidum*, *Ranunculus occidentalis*, *Trifolium wormskjoldii*, *Calamagrostis nutkaensis*, *Melica subulata*, *Fritillaria camschatcensis*, *Poa laxiflora* and *Bromus pacificus*. A number of other species may occur in this zone depending on the extent and exposure of the shore. This

part of the beach is usually heavily browsed by deer, and, as a consequence, such species as *Carex lyngbyei* rarely have flowering culms.

Sand beaches

Two general types of sand beaches are found on the Queen Charlotte Islands. There are the extensive continuous beaches, such as those found along the east and north coasts of Graham Island beginning near Tlell and running north to Rose Spit, and then west to Masset Spit. There are a small number of crescent beaches that have developed between rocky headlands on both the east and west coasts. The only crescent beaches surveyed were those at Lepas Bay on the northwest coast of Graham Island, Kwoon Cove near the mouth of Pocket Inlet on the west coast of Moresby Island, and Woodruff Bay on the southeast coast of Kunghit Island. All sand beaches have a gentle foreshore and an extensive driftwood zone near the limit of the upper tidal zone.

Crescent beaches

Such beaches are found at the heads of exposed bays that are terminated at both ends by rock stacks or bluffs. The large sweeping crescents of sand on the foreshore are devoid of plants because of constant surf action. However, at the upper limit of the tidal zone an extensive network of driftwood provides sufficiently stable habitats for plant communities. There is usually a narrow band of vegetation between the driftwood and the margin of the adjacent forest. If the beach is backed by steeply rising hills, sand blowouts are usually present and only a few plant species occur in the transitional region. This type of development characterizes the crescent beach at Woodruff Bay, where heavy surf and steady on-shore winds produce an unstable habitat for plant growth until the margin of the Sitka spruce forest is reached. The only beach plants noted at Woodruff Bay were *Cakile edentula*, *Lathyrus japonicus* and *Arabis hirsuta*. These three species are sparsely distributed and the only major plant development is found at the forest margin, where *Calamagrostis nutkaensis*, *Elymus mollis*, *Gaultheria shallon*, *Vaccinium parvifolium* and *Maianthemum dilatatum* are the major vegetative elements. Kwoon Cove crescent beach is also subject to heavy surf and few plants are found in the driftwood zone. Immediately adjacent to this zone, blanket bog or dense forest encroaches on the beach. At Lepas Bay the crescent beach is two to three miles long and has a well-developed transitional zone between the driftwood and adjacent forest. The driftwood zone and the immediate open sandy areas between it and the foreshore have scattered plants of *Mertensia maritima*, *Franseria chamissonis*, *Senecio pseudo-arnica*, *Arenaria peploides*, *Carex macrocephala*, *Cakile edentula*, *Elymus mollis*, *Epilobium angustifolium* and *Galium triflorum*. Many species are found in the transition zone between the driftwood band and the forest margin and a few extend into the areas of driftwood. This region has a dense grass cover of *Deschampsia caespitosa*, *Hierochloë odorata* and *Hordeum brachyantherum*. Mixed with these dominants are found such species as *Luzula multiflora*, *Castilleja unalaschensis*, *Equisetum arvense*, *Ranunculus occidentalis*, *Lathyrus palustris* and *Stellaria*



Figure 49. A portion of the continuous sand beach along the east coast of Graham Island near the mouth of the Tlell River. The introduced grass, *Ammophila arenaria* (L.) Link, is the dominant ground cover seen in the semistabilized region of the transitional beach zone immediately behind the driftwood zone.

calycantha. There is a marked difference between the species recorded at Lepas Bay and those found at either Woodruff Bay or Kwoon Cove. This difference may in part be due to the semiprotected nature of the head of Lepas Bay and the development of a relatively large stabilized sandy zone behind the driftwood, which the adjacent forest has apparently not been able to encroach upon, perhaps because of the strong winter storms and prevailing strong on-shore winds at this site.

Continuous sand beaches

The extensive sand beaches found along the east and north coasts of Graham Island from Tlell north to Rose Spit, and from this point west to Masset Spit, provide the habitat for a number of northern range extensions of coastal species. These beaches are much alike. During our 1964 survey considerable time was spent near the mouth of the Tlell River studying the plant associations and recording the distribution of the different species (Figure 49). The following account is based on our observations in the Tlell area. The foreshore at Tlell consists of a gentle sloping sand beach that is subjected to continual surf action. The prevailing on-shore winds have produced an extensive zone of driftwood and a well-established, semistabilized dune area in the transitional zone. There is a progressive development of stabilization of these dunes in the adjacent Sitka spruce woods. This marginal spruce forest is now situated on old dunes and continues for some distance inland. Sand blowouts

are often found in the transitional zone and may even extend into the forest margin.

No vegetation was noted on the foreshore of the continuous sand beaches. A few species, *Cakile edentula* and *Glehnia littoralis* being the most common, are represented by scattered individuals in the driftwood zone. The semi-stabilized region of the transitional zone immediately adjacent to the driftwood contains a number of species that form scattered colonies but not a continuous ground cover (Figures 50 and 51). Important members of this community are *Poa macrantha*, *Poa confinis*, *Elymus mollis*, *Franseria chamissonis*, *Glehnia littoralis*, *Carex macrocephala*, *Rumex acetosella*, *Cerastium vulgatum*, *Hypochaeris radicata*, *Senecio vulgaris*, *Aira caryophyllea*, *Achillea millefolium* and *Fragaria chiloensis*. It is in this vegetational zone that such local and disjunct species as *Senecio pseudo-arnica*, *Lupinus littoralis*, *Lathyrus littoralis*, *Abronia latifolia* and *Convolvulus soldanella* occur. The transitional zone immediately adjacent to the coastal forest has a large number of introductions such as *Taraxacum officinale*, *Hypochaeris radicata*, *Rumex acetosella*, *Aira caryophyllea*, *Veronica arvensis*, *Holcus lanatus*, *Trifolium repens*, *Cerastium viscosum* and *C. vulgatum*, *Ranunculus acris*, and *Senecio vulgaris*. These weeds form the dominant vegetation on sand dunes and flats that have been stabilized mainly by moss species. The few rare species found on these dunes and in sandy meadows of the transition zone are *Rhinanthus crista-galli*, *Lithospermum officinale* and *Solidago canadensis*. Along the east coast of Graham Island where there is an almost continuous strand of gravel and sand, the process of erosion and redeposition of sediments is altering the configuration of the coastline. The spits at Rose Point and at the mouth of the Tlell River are being extended and built up, whereas in other places sea cliffs and coastal bluffs of unconsolidated glacial gravels and sands are being undercut and eroded by wave action. In the Tlell area there is a developing and increasing transitional beach zone in which successive bands of driftwood are found some distance back from the present zone. Several well-stabilized sand dune systems are now well-vegetated and new semistabilized ones are being formed immediately behind the driftwood zone. However, just south of Tlell, the semi-stabilized zone has been eradicated by surf action and foreshore is replacing the elevated and stabilized dune-meadows. Steep sand cliffs are produced at such sites. Patches of vegetation are often undermined by severe storms and slide down the cliff faces on to the foreshore. The latter conditions prevail along much of the coastline north of Tlell, the only difference being that the vegetation zone above the beach is composed of blanket bog. The layers of peat deposit are underlain by glacial clays, sand and gravel and these beds are clearly evident along the cliff faces. Numerous sand blowouts occur along the coast, especially near Rose Spit, but these are usually some distance behind a well-defined driftwood zone and intervening transition zone. Occasional small bodies of standing water are found in depressions close to the shoreline but no vascular plants were noted in any of these. Extreme high tides and on-shore storms continually refill these depressions and the water is highly saline. The stabilized portions of shifting dunes along the margins of blowouts are the habitat for the sand-binding species *Juncus leseurii*, *Calamagrostis nutkaensis*, *Carex macrocephala*, *Elymus mollis* and *Poa macrantha*.

Figure 50. A well-developed stand of *Carex macrocephala* Willd. in the semistabilized region of the transitional beach zone at Tlell.





Figure 51. One of the few colonies of *Abronia latifolia* Eschsch. found in the transitional beach zone at Tlell.

Rose Spit is an extensive, low-lying, slightly undulating dune area without any forest cover. It is subjected to strong wind erosion and there are many small blowouts. A number of weedy species, such as *Rumex acetosella*, *Cerastium vulgatum*, *Trifolium repens* and *Taraxacum officinale*, have become well established. The most abundant indigenous species are *Tanacetum huronense*, *Equisetum arvense*, *Carex macrocephala*, *Lupinus littoralis*, *Poa macrantha*, *Poa confinis*, *Festuca rubra*, *Elymus mollis*, *Fragaria chiloensis*, *Potentilla pacifica*, *Franseria chamissonis*, *Glehnia littoralis* and *Cakile edentula*. The coast from Rose Spit to Masset is essentially one continuous sand beach extending for approximately 30 miles. There are some well-developed transitional zones, including extensive dune systems, in this region. With the exception of *Ammophila arenaria*, the presence of a number of introduced herbs has not significantly affected the stabilization of sand beaches. This species was introduced a number of years ago at Tlell in an attempt to control wind erosion of the dune systems. It has become the dominant ground cover of the fore-dunes (Figure 49), but has not extended into the stabilized dune meadows adjacent to the forest cover nor has it extended laterally along the beach for any appreciable distance. This stand of *Ammophila* is associated with *Poa macrantha* and there are a few isolated clones of *Elymus mollis*.

Rock or Cliff Communities

Much of the coastline of the Queen Charlotte Islands is fronted by steep rocky exposures and cliffs. In such places plants are few or totally absent. Tidal action, the constant buffeting by the surf, and the effect of salt spray produce a bare rocky coastline, which ends abruptly with a densely forested margin just above high tide level (Figure 52). It is only when low coastal bluffs, rock stacks or a sparsely forested margin are present that sufficient space is available above the high tide mark to permit the establishment of species other than those found in the adjacent woods. The number and abundance of species is also directly related to the action of tide and surf and exposure to open sea conditions. More protected sites, such as those found in inlets and behind the headlands of bays, have a more varied vegetation. The rock and cliff communities are of two kinds: those much influenced by salt spray, and those not strongly influenced by salt spray. The vegetative communities found on rocky islets supporting bird rookeries are discussed under a separate heading.

Communities much influenced by salt spray

The littoral zone of these communities (*see* Figure 52) often contains an abundant development of *Phyllospadix scouleri*. There are usually no other flowering plants in the tidal zone, but on rocky exposures above high tide mark are found such species as *Plantago maritima*, *Sedum rosea*, *Potentilla villosa*, *Castilleja unalaschensis*, *Sagina maxima*, *Cochlearia oblongifolia*, *Arenaria peploides*, *Saxifraga ferruginea*, *Fragaria chiloensis*, *Fritillaria camtschatcensis*, *Campanula alaskana*, *Conioselinum pacificum*, *Draba hyperborea*, *Lupinus nootkatensis*, *Achillea millefolium*, *Barbarea orthoceras* and *Arabis hirsuta*. If the rocky shore is extensive and rises to a considerable height above the sea level,

a stabilized community exists. These communities are apparently quite salt tolerant because during stormy weather abundant spray is thrown over the headlands. The composition of the salt spray community differs from that on the open rock faces below, and species such as *Fragaria chiloensis*, *Castilleja unalaschensis*, *Fritillaria camtschatcensis* and *Saxifraga ferruginea* become more abundant. A few shrubby species, for example, *Rosa nutkana*, *Gaultheria shallon* and *Arctostaphylos uva-ursi*, are found in this environment. This habitat also supports colonies of *Plectritis congesta*, *Epilobium angustifolium*, *Sisyrinchium littorale*, *Prunella vulgaris*, *Ranunculus occidentalis*, *Galium aparine*, *Mimulus guttatus*, *Aquilegia formosa*, *Collinsia parviflora*, *Festuca rubra*, *Epilobium minutum*, *Angelica lucida* and *Heuchera chlorantha*. This stabilized community is not really part of the beach flora, but adjoins the rock exposures and cliffs that extend to sea level.

Although similar rock or cliff communities are found on both the east and west coasts, they do not contain many species. The eastern coastal communities of Moresby Island usually have a greater variety of taxa, but this is undoubtedly due to the lower rainfall along this coast, resulting in drier habitats. The extensive chain of rock stacks surveyed along the west coast at Lepas Bay provides an abundance of microhabitats, and as a result there is an increase in the number of taxa. Such species as *Prenanthes alata*, *Dodecatheon pulchellum*, *Juncus arcticus*, *Carex gmelinii*, *Sisyrinchium littorale*, *Aquilegia formosa* and *Campanula alaskana* were noted at Lepas Bay. Characteristic rock or cliff communities

Figure 52. Looking northwest from Mercer Point to Ells Point on the southwest corner of Graham Island. The precipitous and surf-washed rocky shore is typical of most of the western coastline of the Islands.



surveyed include Kaisun and Lepas Bay on the west coast, and Tuft Islets, South Low Island (Figure 53), and Torrens Island (Figure 54) on the east coast.

Rocky islets supporting bird rookeries

During the course of our survey of coastal communities four small islets that possessed bird rookeries were examined, these being outer Skedans Islands, a small unnamed islet off the Bolkus Islands, Horn Rock in Tasu Sound, and one of the Gowdas Islands. All of these islands are subjected to moderately heavy salt spray and their scant soil is heavily nitrified. The vegetation of one of the Gowdas Islands visited is typical of that noted on other bird rookery islands. This small rock island is highly dissected and its summit is approximately 40 feet above sea level. A well-developed zone of *Phyllospadix*, *Fucus* and large brown algae surrounds the base of the island. The crevices and runnels contain scattered plants of *Plantago maritima*, *Cochlearia officinalis*, *Arenaria peploides*, *Sedum rosea*, *Angelica lucida*, *Conioselinum pacificum* and *Draba hyperborea*. The summit of this island, with its relatively dense growth of vegetation, is the main nesting area for a large population of glaucous-winged gulls. The plant species growing here include not only those mentioned, but also *Matricaria matricarioides*, *Mimulus guttatus* ssp. *guttatus*, *Juncus arcticus*, *Agrostis exarata*, *Sagina maxima*, *Plantago major* and a species of *Puccinellia*. There are no shrubs or trees on these sites, but herbaceous species such as *Rumex transitorius*, *Deschampsia elongata*, *Trisetum cernuum*, *Saxifraga ferruginea* and *Stellaria crispa* occa-

Figure 53. South Low Island off the east coast of Moresby Island. Limestone outcrop at the extreme right is habitat for *Saxifraga caespitosa* L. and *Dodecatheon pulchellum* (Raf.) Merrill.





Figure 54. Torrens Island in the mouth of Skidegate Inlet. The cliffs on the left side of the island support a large gull rookery.

Figure 55. Clapp Basin at the head of Shields Bay on west coast of Graham Island. The rocky shoreline is not strongly influenced by surf action and is bordered by dense coastal coniferous forest.



Figure 56. Looking west from Image Point to Haida Point in the mouth of Skidegate Inlet.

sionally occur. These islets are subjected to constant winds and in stormy weather the heavy surf action drenches the whole land mass with a fine salt spray. *Draba hyperborea* occurs on almost all of the exposed islets that have bird rookeries and it is also found on coastal cliffs and rock bluffs in nitrified niches and on ledges where sea birds roost.

Communities not strongly influenced by salt spray

A few rocky shorelines that are not directly affected by heavy surf action were surveyed along both the east and west coasts. These beach communities have rock exposures from the water's edge to above the high tide zone where they are immediately bordered by the dense coastal coniferous forest (Figure 55). In such communities only a few species are found, the most widespread being *Potentilla villosa, Luzula multiflora, Saxifraga ferruginea, Galium triflorum, Senecio sylvaticus, Sagina maxima, Cochlearia officinalis, Festuca rubra* and *Plantago maritima.* This strand community is very sparsely vegetated. A few shrubs such as *Amelanchier florida* and *Pyrus fusca* occur on coastal bluffs along the forest margin, but such species are found only on the east coast. *Gaultheria shallon* is nearly always found in this community on both coasts.

A few specialized coastal communities of rocky exposures not much influenced by salt spray are found along the east coast, particularly in Skidegate Inlet. Two very rich and rewarding areas, Haida and Image points (Figure 56), near Skidegate on the southeast coast of Graham Island, were thoroughly surveyed. These two points are characteristic of many of the open, vegetated bluffs that occur in Skidegate Inlet and along the protected portions of the east

coast of Moresby Island. These two communities are similar with respect to exposure as both face southeast and are partially protected from storms by Jewell Island lying to the southeast in the inlet. The base of the points is strewn with boulders and occasional patches of coarse gravel abut against the sloping rock outcrops which make up the points. The lower portions of these rock bluffs are buffeted by surf, and little vegetation, except for occasional plants of *Plantago maritima* and *Potentilla villosa*, occurs just above the upper tidal zone. Farther up the bluffs, pockets and ledges of soil are present. Along the upper portion of the bluffs, there are wide rock ledges and flat-topped outcrops that

Table 12. Vegetation of the coastal communities of Haida and Image points

Habitat	Species Present	
Salt spray zone	*Festuca rubra*	*Plantago maritima* *Potentilla villosa*
Steep-facing front of bluffs	*Festuca rubra* *Selaginella wallacei* *Aira caryophyllea* *Cerastium viscosum* *Sedum divergens* *Saxifraga ferruginea* *Poa confinis* *Rumex acetosella* *Fritillaria camtschatcensis* *Ranunculus occidentalis*	*Conioselium pacificum* *Hordeum brachyantherum* *Prunella vulgaris* *Fragaria chiloensis* *Plectritis congesta* *Collinsia parviflora* *Castilleja unalaschensis* *Epilobium minutum* *Mimulus guttatus* ssp. *guttatus* *Geranium molle* *Geranium dissectum*
Lushly vegetated ledges and rock outcrops at top of bluffs	*Rosa nutkana* *Sanicula crassicaulis* *Trifolium dubium* *Trifolium repens* *Arctostaphylos uva-ursi* *Carex macloviana* *Cerastium vulgatum* *Taraxacum officinale* *Sonchus arvensis* *Bellis perennis* *Plantago lanceolata* *Phleum pratense* *Carex cryptocarpa* *Luzula multiflora* ssp. *comosa* *Heuchera chlorantha* *Hieracium albiflorum*	*Ranunculus uncinatus* *Ranunculus occidentalis* *Hypochaeris radicata* *Poa pratensis* *Holcus lanatus* *Festuca rubra* *Bromus mollis* *Achillea millefolium* *Polypodium vulgare* ssp. *occidentale* *Aquilegia formosa* *Ranunculus repens* *Ranunculus acris* *Rumex acetosella* *Tellima grandiflora* *Veronica arvensis* *Amelanchier florida*
Shrubby zone adjacent to closed forest	*Ribes lacustre* *Lonicera involucrata* *Amelanchier florida* *Taxus brevifolia* *Juniperus communis* *Rubus parviflorus* *Maianthemum dilatatum* *Goodyera oblongifolia* *Sanicula crassicaulis*	*Salix scouleriana* *Pyrus fusca* *Rubus spectabilis* *Gaultheria shallon* *Vaccinium parvifolium* *Symphoricarpos albus* *Polystichum munitum* *Galium triflorum*



Figure 57. The head of Dawson Inlet in the southwest corner of Graham Island. The tidal marsh in the foreground above the shingle beach is composed mainly of grasses and sedges.

present a rock garden appearance. A secondary-growth forest composed primarily of spruce and occasional red cedar produces a closed forest community at the back of these bluffs.

Table 12 provides a list of species found at Haida and Image points according to the habitat they occupy.

Salt Marshes

The shorelines of many inlets and harbors along the coast are often bordered by salt marshes. These communities can be extensive, as at Naden Harbour or Rose Inlet, or they may be localized near the mouths of meandering rivers, especially at the heads of inlets. The dominant salt marsh elements are essentially grasses and sedges and such communities represent the only extensive lowland meadows on the Islands. The level of salinity of these marshes varies considerably. Those that are flooded by each tidal change (Figure 57) have a high salt content in comparison with those that are flooded only at extreme tides or are inundated by both fresh and salt water. Examples of the latter are the meadows back from the mouth of the Tlell River, Delkatla slough at Masset, and the Yakoun and Kumdis river deltas in Masset Inlet. Both types of marshes are subject to heavy grazing by deer, local cattle herds and waterfowl.

Salt marshes of high salinity

These marshes are fronted by shingle beaches or mud flats. The lower part of the marshes is often reticulately dissected by drainage courses, which become

active during periods of high tides. Isolated saline pools often occur where a drainage course has become blocked off. The water level is replenished with each high tide and it gradually subsides as the tide lowers. Two plant species predominate in these pools and drainage courses, *Ruppia maritima* in the upper reaches, and depauperate but fully reproductive plants of *Zostera marina* in the lower zone. The marsh surrounding these drainage courses is considerably raised and represents a vegetative terrace only inundated during extreme tides or storms. The following species predominate in the frontal marsh zone bordering the shoreline: *Deschampsia caespitosa*, *Hordeum brachyantherum*, *Festuca rubra*, *Agrostis exarata*, *Carex lyngbyei*, *Plantago macrocarpa*, *Stellaria humifusa*, *Triglochin maritimum* and *Trifolium wormskjoldii*. Between this densely vegetated portion of the marsh and the adjacent closed forest, additional species such as *Apargidium boreale*, *Carex pluriflora*, *Galium trifidum* and *Calamagrostis nutkaensis* occur. Two showy composites, *Aster subspicatus* and *Grindelia integrifolia*, are occasionally found in these marshes. These high salinity marshes characteristically have few species and are remarkably uniform throughout the Islands.

Salt marshes of low salinity

The most extensive low-salinity marshes are found near the mouths of rivers emptying into Masset Inlet. The delta regions of these rivers are fronted by an expanse of tidal mud flats, which have a network of drainage courses originating in slightly elevated salt-marsh meadows bordering the adjacent forest. The meadows are partially flooded during high tide, but this tidal water is constantly diluted by fresh water flowing from the river. In the muddy drainage courses, *Ruppia maritima* and occasional plants of *Zostera marina* occur in the bottom, whereas along the margins *Triglochin maritimum*, *Puccinellia pumila*, *Lilaeopsis occidentalis* and *Scirpus cernuus* are found. Grasses and sedges predominate on the densely vegetated terraces between the drainage courses. These low-salinity marshes have a greater number of species than those marshes found along the outer coast. Immediately back of the low salinity marshes are found *Agrostis exarata*, *Hordeum brachyantherum*, *Glyceria occidentalis*, *Carex obnupta*, *Juncus arcticus* ssp. *ater*, *Carex canescens* ssp. *arctaeformis*, *Stellaria humifusa*, *Potentilla pacifica*, *Plantago macrocarpa* and *Apargidium boreale*. The upper part of the marshes adjacent to the forest contains *Calamagrostis nutkaensis*, *Bromus pacificus*, *Elymus hirsutus*, *Agrostis palustris*, *Carex pluriflora*, *Galium trifidum*, *Aster subspicatus* and *Ranunculus orthorhynchus*. This upper portion often has scattered well-developed trees of *Pyrus fusca*, but the forest begins on a still higher level of ground, well beyond any tidal effect. A few alders and willows occasionally border the main river channels in the delta regions.

Two other low-salinity marshes examined were Delkatla Slough at Masset and the large meadow-marsh near the Richardson Ranch at Tlell. Both contained a high proportion of introduced species. These two marshes have had some cultivation and are used as grazing areas for herds of cattle. It will be interesting to observe what changes occur in the composition of the flora and the structure of Delkatla Slough now that a causeway has been built near its mouth and tidal action has been partially curtailed.

BOG AND SWAMP COMMUNITIES

Among the most conspicuous features of the vegetation on the Queen Charlotte Islands are the extensive bog and swamp communities found at all elevations. The description of these communities is difficult because of the large bog terminology now in use. To overcome this problem, we have essentially followed the terminology used by D. A. Ratcliffe in his discussion of Scottish bogs and mires in *The Vegetation of Scotland* edited by John H. Burnett (1964). The bog, swamp, and related communities found on the Queen Charlotte Islands are classified and described in Table 13.

Table 13. Bog and swamp communities of the Queen Charlotte Islands

Community Type	Terrain	Water Relations	Vegetative Cover
Swamp	level	lateral movement of water impeded	
a) wet		water table high	relatively dense vegetation; permanently or seasonally submerged
b) dry		water table high only occasionally, very seldom appearing above ground surface	closed cover of vegetation
Mire	hilly	lateral gravitational seepage of water; water table high, usually near surface, but varying according to season	vegetation cover dense; often considered as a transitional vegetation type between either a bog or a swamp and some other drier vegetative community
Bog	variable	water table high, maintained by high precipitation and low evaporation; often a development of a system of surface pools	
a) raised	usually on more or less flat, low-lying land		vegetation cover dense and living vegetative surface growing above drainage water
b) blanket	usually on contoured uplands, but occasionally at sea level, where rainfall is high		vegetative cover dense except on steep slopes or rock outcrops
Spring	variable	a more or less permanent flow of free-drainage water at or just below the ground surface; volume varying with season	vegetation variable, usually sharply delimited from surrounding nonirrigated vegetation
Rill	variable	a canalized flow of free-drainage water; volume varying with season and local precipitation	vegetation variable, usually sharply delimited from surrounding nonirrigated vegetation
Flush	gentle sloping regions	variable flow of free-drainage water that spreads out on surface to give a more diffuse and less rapid flow of water; volume varying with the season	vegetation sparse, scattered colonies or individual plants; a large amount of mineral substratum exposed producing a gravelly or stony mosaic appearance

Figure 58. A wet swamp in a trough between old beach ridges south of Rose Spit. This swamp has a preponderance of cottongrass, *Eriophorum chamissonis* C. A. Meyer.





Figure 59. Central portion of another wet swamp in the same region that has open water with isolated islands of floating vegetation and abundant development of *Nuphar luteum* (L.) Sibth. & Sm. ssp. *polysepalum* (Engelm.) Beal.

The following account is mainly concerned with lowland communities, excluding blanket bogs. These bogs are found from sea level to mountain summits and they constitute a large proportion of the vegetation of the west coast and Queen Charlotte Ranges.

Swamps

Wet swamps

Wet swamps on the Islands are nearly always found in the depressions between old beach ridges away from the coast (Figures 58 and 59). Numerous examples are found near Rose Spit along the north coast of Graham Island, and in the Sandspit region at the northeast tip of Moresby Island. These swamps usually have some open water and much of the vegetation is in standing water for most of the year. There appears to be little movement of water in or out of these swamps. Their margins have scattered trees of *Pyrus fusca* and *Salix scouleriana* and occasional patches of *Ledum palustre* ssp. *groenlandicum*. Many other species are found in the transitional zone between forest and swamp, but sedges and a few grasses tend to be the dominant elements. The main portion of the swamp is essentially composed of sedges with the dominant species being *Carex canescens*, *C. exsiccata* and *C. phyllomanica*. *Eriophorum chamissonis* (Figure 58) is widely distributed together with *Juncus oreganus*, *Glyceria pauciflora*, *Dodecatheon jeffreyi*, *Galium trifidum* and *Sparganium simplex*. The orchid, *Spiranthes romanzoffiana*, and the sundew, *Drosera rotundifolia*, occur sporadically in this community. In the water and along the open margins of mucky pools such aquatics or semiaquatics as *Callitriche heterophylla*, *Utricularia vulgaris*, *U. intermedia* and *U. minor*, along with *Ranunculus flammula*, *R. hyperborea*, *Potamogeton natans*, *Lycopodium inundatum* and occasional stands of *Scirpus lacustris* ssp. *glaucus* are found. If the area of open water is sufficiently large, other species of *Potamogeton* as well as colonies of *Nuphar luteum* ssp. *polysepalum* may be present (Figure 59). The aspect of the vegetation of these wet swamps seems to be correlated with the depth of the depressions between the old beach ridges. If the swamps are large and possess a fairly deep body of open water in the center, occasional mats of floating vegetation develop. Each wet swamp is characteristically different, even though formed in the depressions of successive beach ridges.

Dry swamps

The dry swamps on the Queen Charlotte Islands are found along the drier terraced shorelines of lakes or in shallow depressions between beach ridges where no standing water occurs. Two such characteristic extensive dry swamps occur at the head of Jalun and Upper Victoria lakes, respectively. These two communities have a dense vegetative cover composed of three dominant species, *Carex obnupta*, *Carex sitchensis* and *Calamagrostis nutkaensis*. *Pyrus fusca* occurs near the forest bordering the back of these swamps and species of willow are usually present. The portion of these swamps adjacent to the lake may be raised above the normal level of the lake or a transitional zone of sand or gravel may intervene between the main swamp and the shoreline. This transitional zone



Figure 60. Gold Creek between Tlell and Port Clements, eastern Graham Island lowlands. The mire community contains *Pyrus fusca* Raf. along the margins of the creek.

has a less dense vegetative cover and such species as *Ranunculus flammula*, *Oenanthe sarmentosa*, *Plantago macrocarpa*, *Juncus falcatus* and *Calamagrostis crassiglumis* occur sporadically. The subdominants or species of sporadic occurrence in any one swamp may vary considerably and it is difficult to characterize such swamps except on the basis of the dominant species first mentioned in this discussion. The presence of *Pyrus fusca* and species of *Salix* often give a savanna-like appearance to these swamps. The mountain alder, *Alnus crispa*, occurs in some of the wet swamps, especially along the west coast in the Queen Charlotte Ranges.

Mires

It is not without some hesitation that the ambiguous term mire is introduced in the discussion of the bog-swamp communities. However, the whole area of extensive bog systems of the eastern lowlands of Graham Island, studied by air photos and by aerial reconnaissance, cannot be classified as one large raised bog community. The polygonal mosaic seen from the air reveals more or less distinctive patches of raised bog and occasional islands of scrubby pine and cedar. These bog patches are separated from one another by a reticulum of sluggish streams bordered by a dense vegetation composed mainly of sedges. This vast network can best be classified as transitional vegetation zones or mires. The best development of these mires occurs in rolling raised bog country in the region between Tlell and Port Clements and in White Creek Muskeg west and south of Tow Hill.

The dominant species in this plant community are *Carex obnupta*, *C. stylosa*, *C. canescens* ssp. *arctaeformis*, *C. stichensis*, *C. pluriflora*, *Dodecatheon jeffreyi*, *Habenaria dilatata*, *Pyrus fusca* and *Ledum palustre* ssp. *groenlandicum*. A characteristic mire community is found near the sluggish and meandering creeks that crisscross the raised bogs on the road between Tlell and Port Clements (Figure 60). The mires form part of the drainage systems that are found throughout these bogs These mire communities form an important portion of the flora in the lowlands of eastern Graham Island, but the diversity of species makes them hard to describe.

Bogs

The bog communities of the Queen Charlotte Islands represent an important constituent of the vegetation. Much of the extensive eastern lowlands of Graham Island can be classified as a continuous series of raised bogs. The vegetation of the upland mountainous regions is composed of intermittent blanket bogs and forest communities. Only the two main types of bog community found on the Queen Charlottes are described here.

Raised bogs

An aerial reconnaissance of the raised-bog communities reveals a pattern of open bogs with an interconnected network of thin bands of forest and mire communities. In the large raised bogs (Figures 61 and 62), occasional islands of scrubby pine and cedar often occur and these islands are part of the raised bog community on the Queen Charlottes. Within the open part of the bogs many small pools are scattered throughout an otherwise continuous ground cover. The depth of these pools varies and in the deeper ones *Nuphar luteum* ssp. *polysepalum* is often found. The undulating and hummocky open portion of the bogs is characterized by the following woody species: prostrate *Juniperus communis*, *Empetrum nigrum*, *Ledum palustre* ssp. *groenlandicum*, *Kalmia polifolia*, *Cornus intermedia*, *Andromeda polifolia*, *Loiseleuria procumbens*, *Vaccinium oxycoccus*, *V. vitis-idaea*, *V. uliginosum*, *V. caespitosum*, and the occasional stunted *Pinus contorta*. The herbaceous cover consists of *Scirpus cespitosus*, *Carex pauciflora*, *Agrostis aequivalvis*, *Calamagrostis caespitosa* ssp. *beringensis*, *Tofieldia glutinosa*, *Fauria crista-galli*, *Apargidium boreale*, *Gentiana douglasiana*, *Trientalis europaea*, *Pinguicula vulgaris* and *P. villosa*, *Drosera rotundifolia*, *Selaginella selaginoides*, *Rubus chamaemorus*, *Sanguisorba officinalis* ssp. *microcephala*, and *Coptis trifolia*. In the wetter portions of the bogs, particularly around the margins of bog pools, are such species as *Dodecatheon jeffreyi*, *Carex livida*, *C. pluriflora*, *C. pauciflora* and *Eriophorum*.

The more or less isolated islands of pine and red cedar are found in the drier portions of the bogs. In and around these islands there is an aggressive development of *Ledum* and stunted *Gaultheria*, and the immediate ground cover is characteristically composed of *Vaccinium vitis-idaea*, *Coptis asplenifolia*, *Lycopodium annotinum* and *Carex obnupta*. Scattered plants of *Habenaria saccata* are found in these wooded islands of vegetation, and usually *Linnaea borealis* and *Cornus unalaschensis* are also present.



Figure 61. Open raised bog immediately southwest of Tow Hill and behind the coastal sand-dune forest community on the north coast of Graham Island.

Figure 62. Extensive rolling raised bog region called White Creek Muskeg in the northeastern region of Graham Island.



Blanket bogs

The most conspicuous and best-developed blanket bogs are found along the west flanks of the Queen Charlotte Ranges. Such communities are normally found on undulating, rocky terrain. Rock outcrops usually project above the thin bog mantle. The high amount of precipitation along the west coast perpetuates blanket bogs and the frequent rills and flushes found in these communities. There are stunted "bonsai" conifers scattered throughout the bogs. The peculiar appearance of these trees reflects the strong and persistent westerly winds that sweep in from the adjacent ocean. The description of the blanket bog community and its species is based on an extensive four-day survey conducted in the Upper Victoria Lake area (Figures 63 and 64), and a two-day survey of the Mount Russ region (Figure 65) near the mouth of Kootenay Inlet. Both these localities are on the west coast but the blanket bogs are similar to others on both the east and west coasts.

The conifers *Pinus contorta*, *Thuja plicata*, *Tsuga heterophylla* and *Chamaecyparis nootkatensis* are the dominant tree species found in the bogs. *Taxus brevifolia* and *Alnus crispa* occur occasionally and in the bog below Mount Russ a few prostrate plants of *Juniperus communis* are present. The herbaceous cover is similar to that of the raised bogs, but a number of subalpine taxa are also found. The more common subalpine species are *Senecio cymbalarioides* ssp. *moresbiensis*, *Erigeron peregrinus*, *Veratrum eschscholtzii*, *Habenaria chorisiana*, *Geum calthifolium* and *Luetkea pectinata*. Other common lowland species are *Fauria crista-galli*, *Gentiana douglasiana*, *Trientalis europaea*, *Dodecatheon jeffreyi*, *Blechnum spicant*, *Agrostis aequivalvis*, *Carex leptalea*, *C. livida*, *C. obnupta* and *C. phyllomanica*, *Eriophorum angustifolium*, *Luzula multiflora*, *Tofieldia glutinosa*, *Apargidium boreale*, *Vaccinium vitis-idaea*, *V. uliginosum*, *V. caespitosum*, *Loiseleuria procumbens*, *Coptis asplenifolia*, *Empetrum nigrum*, *Cornus unalaschensis*, *Andromeda polifolia*, *Kalmia polifolia*, *Rhynchospora alba* and *Ledum palustre* ssp. *groenlandicum*.

There are often many large pools and these are bordered by or contain *Sparganium hyperboreum*, *Nuphar luteum* ssp. *polysepalum*, *Menyanthes trifoliata*, *Juncus oreganus*, *Eriophorum angustifolium*, *Potamogeton natans* and *Myrica gale*. The pools are often interconnected by a series of rills, which only become functional when the water level in the saturated blanket bog is raised by frequent rainstorms. Each pool is rimmed by a densely vegetated border and is separated from its drainage rill by a peatlike dam. During periods of high rainfall or heavy rainstorms the dam may be removed and a flush may develop. For the botanist who aspires to become a hydraulic engineer, the manipulation of pond dams and the subsequent change of rill systems can provide an interesting diversion from botanical pursuits. The vegetation found in the flushes is often quite distinct from that of the surrounding blanket bog and such species as *Equisetum variegatum*, *Triglochin palustris*, *Carex viridula*, *C. physocarpa*, *Juncus falcatus*, *J. ensifolius* and *Ranunculus flammula* may occur. The only collection of *Juncus triglumis* from the Islands was made in a flush at Upper Victoria Lake. The presence of rills and flushes with exposed mineral substratum in blanket bogs is in sharp contrast to the raised bogs in which there is no rapid flow of water through a system of pools and rills. The drainage systems of the blanket



Figure 63. Looking west from Yatza Mountain over Upper Victoria Lake to the Pacific Ocean.

Figure 64. Upper Victoria Lake region. The prominent tree in the center is a "bonsai" *Tsuga heterophylla* (Raf.) Sarg.





Figure 65. Russ Lake near Kootenay Inlet on west coast of Moresby Island. Note the flush in foreground. The region is essentially one continuous blanket bog.

Figure 66. Skidegate Lake, Moresby Island. Numerous snags remain from extensive fire damage. A *Nuphar luteum* (L.) Sibth. & Sm. ssp. *polysepalum* (Engelm.) Beal stand is in foreground.



bog provide habitats that are not available in a raised bog and consequently the number of species in a blanket bog is usually greater. The presence of subalpine taxa further increases the diversity of this community. There are no distinct islands of conifers in blanket bogs, but the trees are scattered more or less at random.

FRESH-WATER AQUATIC COMMUNITIES

The fresh-water aquatic vegetation on the Queen Charlotte Islands is associated with either bog or swamp communities and the occurrence and distribution of the aquatics are included in the discussion of the relevant community types. There are, however, several large lakes that support submerged or floating aquatic plant communities. Of the large lakes surveyed, the three most important are Mosquito, Skidegate (Figure 66) and Yakoun. Only in these lakes were the species of aquatics as numerous as in similar bodies of water on the mainland. All three lakes lie in valleys immediately adjacent to the Queen Charlotte Ranges. They have relatively clear water in comparison with the brown-colored ponds and lakes found in rolling bog country. The bottoms of bays in the three lakes all contain some sand and coarse gravel. The water level of these lakes is not subject to large changes and a more or less uniform environment prevails.

The occurrence and distribution of fresh-water aquatics on the Queen Charlottes present a number of interesting problems. We have arrived at similar conclusions to those proposed by Pearsall (1921, p. 267), who stated that "the distribution of submerged aquatics in lakes depends upon the character of the substrate rather than upon the variation in the composition of the lake waters or in the physical conditions of the habitat." The character of the substrate can be quite varied and depends upon the size of the substrate particles, slope, and stability with respect to water turbulence. A list of the aquatic plants found in five lakes is given in Table 14. It was not possible to make a complete survey of any of the lakes during either the 1957 or 1964 surveys. However, a number of fairly representative aquatic habitats were examined in each lake.

The large number of aquatic taxa found in Yakoun, Skidegate and Mosquito lakes is partly related to the expansive areas of shallow-watered, sandy and stony shores available for the establishment of aquatic communities. Upper Victoria Lake has a shoreline similar to that of the above lakes, yet it has few aquatic species; the high rainfall on the west coast accounts for a rapid fluctuation in lake level and this phenomenon coupled with wave action may restrict the establishment of a number of species. When we were making a four-day survey of Upper Victoria Lake area in the summer of 1964, a severe rainstorm raised the level of the lake two feet overnight. In addition, the high winds accompanying the storm displaced a number of aquatic plants and caused conspicuous changes of the sandy shorelines. The relatively unstable character of the sandy substratum in this lake would prevent the establishment of a number of aquatic plants. The fifth lake included in Table 14, namely Pure Lake, is a shallow body of water in one of the low-lying raised bog areas of the eastern lowlands of Graham Island. The shoreline is composed of stones and sand, the beach has a gradual slope, and the margin of the lake is shallow-watered. The water is particularly brown and is derived from drainage systems of adjacent bog

communities. This lake has a conspicuous lack of aquatic vegetation. Along the shore and extending out to a depth of approximately 3 feet, *Isoetes echinospora* ssp. *muricata* and *Lilaeopsis occidentalis* form a nearly continuous vegetative cover on the stony bottom. Closer to the shore, isolated clones of *Juncus oreganus* are found. Beyond a depth of 2 feet, *Nuphar luteum* ssp. *polysepalum* often forms dense colonies. The depauperate aquatic flora of this lake is undoubtedly due to the lack of any extensive and suitable stabilized sandy foreshore and also to the relatively small area of the lake in comparison to the large area covered by Mosquito, Yakoun and Skidegate lakes.

The three large lakes have a well-developed debris zone of submerged logs starting at a depth of 4 to 6 feet and continuing out into the lake. This zone is usually barren except for the presence of *Nuphar* and occasional colonies of *Potamogeton*. Almost all the aquatic plants occur in a usually narrow zone extending out from the shoreline until a depth of about 4 feet of water occurs.

The shoreline of Skidegate Lake often consists of a rich, well-packed terrace of humus composed partly of ash that has resulted from the extensive burn surrounding the lake. In a few places there are flat muddy shorelines with scattered

Table 14. Occurrence of aquatic plants in five lakes on the Queen Charlotte Islands

Aquatic Species	Lakes				
	Skidegate	Mosquito	Yakoun	Upper Victoria	Pure
Equisetum fluviatile	x		x		
Equisetum palustre	x				
Isoetes echinospora ssp. *muricata*	x	x	x	x	x
Sparganium minimum			x		
Sparganium simplex	x		x		
Potamogeton berchtoldii ssp. *berchtoldii*	x	x			
Potamogeton epihydrus ssp. *nuttallii*		x	x		
Potamogeton gramineus	x	x			
Potamogeton natans	x	x	x	x	
Potamogeton nodosus	x		x	x	
Potamogeton richardsonii		x	x		
Potamogeton robbinsii	x				
Elodea canadensis	x	x			
Glyceria occidentalis			x		
Eleocharis acicularis	x				
Eleocharis obtusa	x				
Scirpus lacustris ssp. *glaucus*			x		
Juncus oreganus	x		x	x	x
Nuphar luteum ssp. *polysepalum*	x	x	x	x	x
Ranunculus aquatilis	x	x	x		
Subularia aquatica ssp. *americana*	x	x			
Callitriche heterophylla ssp. *bolanderi*			x	x	
Myriophyllum spicatum		x			
Lilaeopsis occidentalis	x	x	x		x
Utricularia intermedia			x		
Utricularia vulgaris	x				
Lobelia dortmanna	x	x	x		
Totals	19	13	17	6	4

hard-pan patches. Such areas are inundated by spring runoff and exceptionally heavy rains. It is in such habitats that *Lilaeopsis occidentalis*, *Eleocharis obtusa*, *E. acicularis* and *Juncus oreganus* are found. Most aquatic plants are found on a sandy to somewhat pebbly substratum that is covered by water a few inches to 2 or 3 feet deep.

There are few aquatic vascular plants in the rivers and creeks of the Queen Charlotte Islands, especially in those that arise in the Queen Charlotte Ranges or Skidegate Plateau. This is partly due to the rapid flow and abnormally high volumes of water from heavy rainfall during much of the year. Only in the river and creek systems of the lowlands of eastern Graham Island may a significant number of aquatics be expected, but even here the number is few. In fact, aquatic communities have arisen only near the mouths of rivers. They are discussed under Maritime Communities.

FOREST COMMUNITIES

One of the most intriguing and yet baffling problems concerning plant communities on the Queen Charlotte Islands is that of identifying and describing the various forest types. Day (1957) lists three basic types, meadow forest, transitional meadow forest, and closed forest. The meadow forest can also be called an alluvial river forest.

Our studies on the Islands show that two additional forest communities should be added, the coastal sand-dune forest and the logged-over forest. The latter community is included in the forest vegetation types, although in the early stages of development the presence of forest species is of secondary importance to the pioneering shrubs and herbs. The rapid increase in logging operations on the Charlottes during the past ten years places the logged-over forest community in an important position with respect to spread and development of forest species on the Islands.

The transitional meadow forest, which Day (1957) recognizes, represents only one of the many transitional forest communities found on the Islands. The parameters of any forest community are difficult to determine as there is a constant intergrading of forest types depending upon the topography and general climatic conditions. An attempt has been made to describe some of these transitional zones under each forest type. We have not included the transitional meadow forest as a subheading, but have included it under Meadow Forest Communities.

The forests of the Queen Charlotte Islands are in many ways similar to those on the adjacent mainland. However, some notable species, such as *Abies amabilis*, *A. lasiocarpa* and *Populus trichocarpa*, and shrubs or small trees such as *Prunus virginiana* and *Rhamnus purshiana* are absent. The forests on the Islands are composed mainly of coniferous species in varying amounts: *Tsuga heterophylla* (western hemlock), *Thuja plicata* (western red cedar), *Picea sitchensis* (Sitka spruce), *Pinus contorta* (lodgepole pine), and *Alnus rubra* (Oregon alder) at lower elevations. At higher elevations, or in forests found along the flanks of the mountain ranges, the five species already listed are supplemented by *Taxus brevifolia* (western yew), *Chamaecyparis nootkatensis* (yellow cedar), *Tsuga merten-*

siana (mountain hemlock), and *Alnus crispa* ssp. *sinuata* (Sitka alder). In mature lowland forests *Tsuga heterophylla* is the dominant species followed by *Thuja plicata* and *Picea sitchensis*. In the upland forests *Tsuga mertensiana* becomes an increasingly more prevalent constituent as the altitude increases. The lowland forest communities provide an important source of wood, which is used in the construction trade (*see* Forestry).

The following general description of forest communities places emphasis on the herbaceous and shrub associates found within each community. For a detailed description of forest cover and site analysis the reader is referred to the article by Day (1957).

Coastal sand-dune forest community

A distinctive forest community is found on the old sand ridges, which extend for some distance away from the beach along the eastern coast of Graham Island from Tlell to Rose Spit and west on the north coast to Masset. Similar forest communities have also been observed at the head of bays near the southern tip of Moresby Island and on Kunghit Island, particularly in the Cape St. James region. This forest community looks like an open park. There are almost no shrubs in the understory. Sitka spruce is the dominant element and many sites have pure stands of this species. The ground is covered by mosses and there is a sporadic distribution of herbaceous plants. Among the most common herbs are *Maianthemum dilatatum*, *Calypso bulbosa* ssp. *occidentalis*, *Goodyera oblongifolia*, *Trifolium wormskjoldii*, *Rumex acetosella*, *Hypochaeris radicata*, *Osmorhiza*

Figure 67. Coastal forest community near Jungle Beach on east coast of Graham Island. The abundant ground cover is *Polystichum munitum* (Kaulf.) Presl.





Figure 68. Meadow forest community along Tarundl Creek west of Queen Charlotte City, Graham Island, containing mature *Alnus rubra* Bong., *Tsuga heterophylla* (Raf.) Sarg., and *Picea stichensis* (Bong.) Carr. (Photograph courtesy Dr. A. Sutherland Brown.)

chilensis, *Achillea millefolium*, and *Viola adunca*. Away from the beach, one of two changes in the community occurs. There may be either the development of a shrub understory, or a progressive decrease in the amount of ground cover with respect to the number and density of herbaceous species. The development of a shrub understory characterizes the northern coastal forest community of Graham Island. Immediately behind the open, parklike community fronting the beach, a dense understory of *Gaultheria shallon* predominates. Occasional shrubs of *Vaccinium parvifolium* are present and there are scattered colonies of *Polystichum munitum*. *Alnus rubra* is found in wetter sites and there is gradual increase in the frequency of *Tsuga heterophylla*. The *Gaultheria shallon* zone is narrow and there is a rapid transition to a mixed hemlock and spruce community. The ground cover is almost entirely composed of mosses, although there are a few scattered individuals of *Listera caurina*, *Calypso bulbosa* ssp. *occidentalis*, *Corallorhiza maculata* ssp. *mertensiana*, *Moneses uniflora*, *Goodyera oblongifolia* and *Maianthemum dilatatum*. The trees are clothed in mosses, and *Polypodium vulgare* ssp. *occidentale* occurs as a frequent epiphyte (*see* Frontispiece). In some coastal forest communities the open parklike forest adjacent to the beach is covered with moss and only an area of dense *Polystichum munitum* represents the transitional zone. Such a community is near Jungle Beach south of Tlell (Figure 67). The coastal sand-dune forest community is relatively poor in species. The only significant increase in the number of species occurs along streams cutting through the community or on the upturned and soil-filled stumps of fallen trees. Such stumps are usually completely covered with vegetation, and often shrubs such as *Ribes bracteosum*, *Rubus spectabilis* and *Sambucus racemosa* grow on them. A number of herbs, including several fern species, also occupy these specialized habitats.

Meadow forest communities

Meadow forest communities are found on alluvial flats and terraces beside rivers and creeks. It is in this forest community that the largest conifers occur. The rather open understory with a semiopen canopy contains an abundant array of herbs. Sitka spruce predominates but western hemlock and Oregon alder and a few western red cedar are scattered throughout the community. During the summer of 1964 we made a study of a meadow forest near the junction of Ghost Creek and the Yakoun River immediately north of Yakoun Lake. This community showed many similarities to other meadow forests surveyed on Honna River, Tarundl Creek (Figure 68), Mamin River, Blackwater Creek and Kumdis Creek. The physical features of the Yakoun River meadow forest community clearly indicate that the river has not always run in its present course. The forest floor is undulating and previous oxbows and drainage courses are now completely vegetated. There is evidence of flooding and inundation of low-lying areas, and silt deposits of considerable depth are found in some parts of the community. The meadow forest community is restricted to the immediate area of the general river course and the nearby terraces. A predominantly hemlock forest adjoins this parklike community.

The forest floor has a dense vegetation composed of *Elymus hirsutus*, *Trisetum cernuum*, *Melica subulata*, *Galium triflorum*, *Tiarella trifoliata*, *Carex mer-*

tensii, *C. laeviculmis*, *Osmorhiza purpurea*, *Circaea alpina*, *Montia sibirica*, *Gymnocarpium dryopteris*, *Ranunculus uncinatus*, *Dryopteris austriaca* and *Luzula parviflora*. Scattered throughout the community are such species as *Veratrum eschscholtzii*, *Festuca rubra*, *Carex deweyana* ssp. *leptopoda* and *Viola glabella*. Here *Cardamine angulata* grows and *Polystichum braunii* produces striking colonies of beautifully symmetrical plants. Well-developed stands or occasional specimens of *Oplopanax horridus* and *Vaccinium ovalifolium* represent the main shrubs found in this community. Along the banks of the river are scattered shrubs of *Cornus stolonifera*, and *Ribes bracteosum* is nearly always present on upturned stumps or growing on the tops of old upright stumps of previously logged trees. The margin of the meadow is rimmed with a zone of *Vaccinium ovalifolium*, *Menziesia ferruginea* and scraggly shrubs of *Gaultheria shallon* where it merges with the hemlock forest. Behind this zone the more or less sterile forest floor of the mature closed woods contains only a few scattered shrubs in places where gravel bars or exposed sills or dikes occur in the river channel. Occasional subalpine plants may be found. These transplants are undoubtedly carried down the river system during spring floods. On one series of exposed dikes in Blackwater Creek, just above a small falls not far from the junction with Mamin River, such species as *Epilobium delicatum*, *Viola palustris*, *Prunella vulgaris*, *Mimulus guttatus* ssp. *haidensis*, *Juncus ensifolius*, *Saxifraga mertensiana*, *Arnica latifolia*, *Caltha biflora* and *Prenanthes alata* occur. Along the sides of the small canyon near the falls *Aquilegia formosa*, *Adiantum pedatum*, *Aruncus sylvestris*, *Heuchera glabra* and *Valeriana sitchensis* were found.

Closed forest community

The closed forest community occupies the main portion of the lowland forested region on the Islands. It is essentially a western hemlock forest with occasional western red cedar and Sitka spruce. Oregon alder occurs only along creeks and is not found in the well-drained closed forest. The canopy is normally dense and is only broken along drainage courses or where trees have fallen or have been blown down. Noteworthy is the lack of any continuous understory shrub layer or ground cover of herbs. The forest floor is completely covered with bryophytes and nearly all shaded portions of trees have a moss or lichen cover. In the mature closed forest there may be gaps of as much as 20 feet in which no herbs are present and those that do occur are widely scattered. The ground cover or shrub layer increases in density only in wet depressions or in areas where the canopy is open. Most herbs and shrubs found in closed forests do not reproduce sexually as often as they do in more exposed habitats, and a number of species in the closed forest habitat were not collected in either flower or fruit during an entire season.

The well-drained and drier portions of the closed forest contain scattered shrubs of *Vaccinium parvifolium*, *V. ovalifolium*, *V. alaskense* and *Menziesia ferruginea*. The most common herbs are *Tiarella trifoliata*, *Luzula parviflora*, *Gymnocarpium dryopteris*, *Maianthemum dilatatum*, *Listera caurina*, *Streptopus streptopoides*, *S. roseus*, *Lycopodium annotinum* and *Blechnum spicant*. Wherever low depressions occur, *Coptis asplenifolia*, *Carex laeviculmis*, *Moneses uniflora*, *Lysichiton americanum*, *Listera cordata*, and *Lycopodium selago* ssp. *miyoshianum*

become more common. *Rubus pedatus*, *R. spectabilis*, *Ribes bracteosum*, *Cornus unalaschensis* and *Dryopteris austriaca* usually occur on upturned stumps or along banks of small rivulets. Occasional plants of *Streptopus amplexifolius* may also be found in such habitats. In low depressions beside small creeks, small colonies of *Circaea alpina* and *Galium kamtschaticum* are often present. It is interesting that many seedlings of *Rubus spectabilis* were found in closed forests, but only rarely did they develop much beyond this stage unless they occurred in a small clearing or on an upturned stump. The random occurrence of this species throughout the forest may be a result of seed dissemination by birds. The only seedling trees observed in this community were western hemlock. A few young Sitka spruce were noted along the banks of creeks, but seedlings of this species were completely absent from the main forest area.

Logged-over forest communities

These communities form a kaleidoscope of both native and introduced species. All logged-over areas differ, either in species composition or in the stage of regeneration. In some logged-over areas fire has swept through the community and this has further effected a change in the composition. In general, weedy species, whether native or introduced, appear to be maintained along the disturbed margins of logging roads and they rapidly invade newly logged sites. Common pioneers are *Rumex acetosella*, *Cerastium vulgatum*, *Poa annua*, *Stellaria crispa*, *Galium triflorum*, *Holcus lanatus*, *Digitalis purpurea*, *Rubus pedatus*, *Gymnocarpium dryopteris*, *Gaultheria shallon*, *Luzula multiflora*, *Cornus unalaschenis*, *Epilobium glandulosum* and *Sambucus racemosa* ssp. *pubens*. Many other species soon become widespread throughout these logged areas. All three principal lowland species of conifers, *Tsuga heterophylla*, *Thuja plicata* and *Picea sitchensis*, soon become established. *Picea* and *Thuja* regenerate well, but the severe browsing of young seedlings of western red cedar by deer suppresses the development of this species in all regions we have studied. In low-lying logged regions, *Alnus rubra* becomes dominant, and it is nearly impossible to walk through the very dense growth of secondarily developed alder woods. The use of herbicides in present forest management is reducing or eliminating these alder woods. The ratio of spruce to hemlock and red cedar in logged areas is being increased by artificial seeding and planting operations. The logged-forest communities provide interesting biological laboratories for determining the rate and distance of spread of several native and introduced species and their relative competitive ability.

MONTANE COMMUNITIES

The various montane communities of the Queen Charlotte Islands are hard to define because of the presence of montane plants from the mountain summits to just above sea level, especially on the west coast. The ability of such species to become well established at low elevations is partly due to the uniform climate in the mountainous ranges at low and high altitudes. The Queen Charlotte Ranges are in a region of extremely high precipitation and for many days of each year the mountains are enshrouded in clouds and receive light to heavy rainfall. The constant prevailing westerly winds, a uniformly cool and equitable climate with



Figure 69. Mosquito Mountain (3,100 feet), Moresby Island. Alpine meadows in saddle below peak.

high humidity at all seasons, and a rugged and rocky terrain have created an environment for montane elements on exposed headlands and steep west-facing slopes at low elevations. The unique presence of montane species at sea level and at such a low latitude can also be accounted for if we examine the terrain and plant communities along the west-facing slopes of the Queen Charlotte Ranges. In many areas blanket bogs are continuous from sea level to mountain summits, thus providing a pathway for the descent of some montane species to sea level. Sparsely vegetated runnels on steep mountain slopes provide an alternate pathway for migration. Nevertheless a number of montane species are essentially restricted to more or less distinct habitats at high altitudes. The survey of montane communities is not all inclusive but is restricted to those habitats where vegetation was studied in some detail. The total amount of high montane area available on the Islands for plant development is very small. Such habitats are in the high mountain masses near the southern end of Graham Island and in the region immediately south of the Skidegate Inlet on Moresby Island (Figure 69). These two regions have some peaks 4,000 feet high. Few areas in the mountains can truly be said to be above tree line, as stunted trees are found near the summit on all mountains wherever the exposure and substratum are suitable. Only rarely is there krummholz and even then it is restricted to a narrow zone and is poorly developed.

The composition of plant communities of different habitats in the montane regions of the Queen Charlotte Islands is remarkably uniform. Mountain meadows, talus slopes, heaths, cliffs and rock runnels all have many species in common. Because moisture is plentiful in all habitats throughout the growing season, there are no really distinct plant assemblages such as those found in snow-bed and snow-flush communities in many other mountainous regions. The type of substratum is the prime factor influencing the establishment and colonization of many species, and the degree of exposure and the amount of bare soil open for colonization is important in other cases. Plants of montane meadows, heaths, talus slopes and other rocky exposures are listed in the following paragraphs.

Meadows

On flats and gentle slopes along valley bottoms at or near tree line, where there has been some accumulation of soil, lush meadow communities may develop. In one such meadow on the north side of Takakia Lake (Figures 70 and 71), on flats bordering a creek, the following montane and lowland species were recorded: *Senecio triangularis*, *Mitella pentandra*, *Habenaria saccata*, *Vahlodea atropurpurea* ssp. *paramushirensis*, *Eriophorum angustifolium*, *Erigeron peregrinus*, *Veratrum eschscholtzii*, *Saxifraga punctata*, *Parnassia fimbriata*, *Cardamine umbellata*, *Epilobium delicatum*, *Tiarella trifoliata* and *T. unifoliata*, *Dodecatheon jeffreyi*, *Heracleum lanatum*, *Viola glabella*, *V. langsdorffii* and *V. biflora* ssp. *carlottae*, *Carex macrochaeta*, *Deschampsia caespitosa* and *Phleum alpinum*. Well-developed, densely vegetated meadow communities were also noted near tree line a few miles south of Jalun Lake near the north end of Skidegate Plateau and in a montane valley below the summit of Mosquito Mountain at the head of Cumshewa Inlet (Figure 69). These mountain meadows are flooded by melting winter snow and after heavy summer rains. No two subalpine meadows have



Figure 70. Takakia Lake. A small alpine lake at about 1,900 feet in the northeastern region of Moresby Island.

Figure 71. Montane meadow near the northeast corner of Takakia Lake.



exactly the same floristic composition, but grasses, sedges and herbaceous species such as *Senecio triangularis*, *Heracleum lanatum*, *Erigeron peregrinus* and *Veratrum eschscholtzii* are usually the dominant elements. In addition to these wet meadows on flats bordering rivulets and runoff drainage courses there are somewhat drier meadows on open slopes from tree line to the mountain summits. These meadows cannot be definitely grouped into different types on the basis of species composition. Almost all the montane species except those restricted to rocky habitats may occur in such meadow communities.

Heaths

Heaths are characterized by a dense ground cover interrupted by rock outcrops or loose aggregations of small and large boulders (Figures 72 and 73). Numerous rills and flushes are usually present. The most significant feature of the heath community is the dominance of shrubby ericaceous species such as *Cassiope lycopodioides* ssp. *cristapilosa*, *C. mertensiana* and *C. stelleriana*, *Phyllodoce glanduliflora* and *Vaccinium caespitosum*. Other species often found on these heaths are: *Luetkea pectinata*, *Senecio newcombei* and *S. cymbalarioides* ssp. *moresbiensis*, *Erigeron peregrinus*, *Pedicularis ornithorhyncha*, *Lycopodium selago* ssp. *selago* and *L. sabinaefolium* ssp. *sitchense*, *Tiarella unifoliata* and *Calamagrostis purpurascens* ssp. *tasuensis*. Along the margins of rills and flushes, *Saxifraga punctata* and *S. lyallii* ssp. *hultenii*, *Mimulus guttatus* ssp. *haidensis*, *Petasites nivalis*, *Leptarrhena pyrolifolia*, *Caltha biflora*, *Parnassia fimbriata*, *Romanzoffia sitchensis*, *Geum calthifolium* and *Isopyrum savilei* commonly occur. The composition of the heath community varies with the slope and exposure, and the extent of the rocky terrain. Any change in the substratum is marked by a noticeable change in the composition of the vegetation. Microhabitats seem to be more significant in the montane zone. The heaths, because of their varied environmental niches, are usually represented by a rich assemblage of plant species. We would like to stress that the heath and meadow communities on steep, open mountain slopes may intergrade almost imperceptibly and that the herbaceous species in each may be about the same.

Talus slopes

In almost any montane region talus slopes are suitable habitats for a number of alpine and subalpine species. In many places a talus slope provides a pathway for montane species to reach lower elevations. On the Queen Charlotte Islands nearly all talus slopes are composed of large boulders and there is a distinct absence of the fine shale or rubbly talus slope that is so characteristic of the Canadian Rocky Mountains. The type of bedrock found throughout the Queen Charlotte Ranges and the humid climate of the Pacific Coast have not been conducive to the formation of extensive talus slopes of finely weathered material. There are no species found on the Charlottes that are restricted to talus slopes, but a number grow in this habitat. Typical species are: *Cryptogramma crispa* ssp. *acrostichoides*, *Ranunculus cooleyae*, *Saxifraga taylori*, *S. punctata*, *S. ferruginea* and *S. lyallii* ssp. *hultenii*, *Geum calthifolium*, *Oxyria digyna*, *Luetkea pectinata* and *Cardamine umbellata*. Plants of the more stabilized talus slopes are similar to those of the open and rocky heaths that often abut onto slide and talus areas.

Figure 72. Open, south-facing heath slopes on north side of Takakia Lake. Saddle is about 2,500 feet and is habitat for *Pedicularis lanata* Cham. & Schlecht. and *Polygonum viviparum* L. The drainage rills in foreground contained *Hippuris montana* Ledeb.



Figure 73. Heath community in foreground above Takakia Lake. Conspicuous light-colored rock outcrop in center is limestone. Cliffs and rock stacks in background are typical habitats for *Salix reticulata* L. ssp. *glabellicarpa* Argus, *Saxifraga oppositifolia* L. and *Silene acaulis* L. ssp. *subacaulescens* (F.N. Williams) Hitchc. & Maguire.

Figure 74. Typical talus slope on Queen Charlotte Islands on the east face of Mount de la Touche above Fairfax Inlet.



Figure 75. Rock runnel on mountain near Shields Bay, Graham Island. The sides of such runnels provide the habitats for many of the endemic taxa on the Islands.

Cliffs, runnels and other rock outcrops

Many of the species that occur in the rocky montane communities are those that apparently cannot withstand severe competition from other herbaceous species. They are usually found in cliff crevices, on rock ledges, or on boulders or outcrops along the margins of sparsely vegetated runnels. The plant species of various rocky exposures differ greatly. Such differences can be accounted for by the amount of exposure to wind, sun and rain, the presence or absence of seeping water, the rock type, and the extent of the rock mass or outcrop. Two chief types of plant community occur in rocky habitats in the montane region. One is found in runnels on wooded mountain slopes and the other is confined to the extensive areas of cliff and outcrop that occur above tree line. The runnels (Figures 74 and 75) provide a ready pathway for the dispersal of high montane species to low elevations. They usually have a small flow of water running through the rubble, although occasionally the water may appear at the surface for short distances. Many of the runnels have been deeply cut in bed rock and have little vegetation along their floors, especially where the runnels narrow and there is a torrent of water following snowmelt and heavy rains. No two runnels have exactly the same floristic composition, but almost all have in common a few species such as *Lloydia serotina* ssp. *flava*, *Carex circinata* and *C. macrochaeta*, *Saxifraga mertensiana*, *Viola biflora* ssp. *carlottae*, *Geum calthifolium* and *Isopyrum savilei*. Typical of the runnels surveyed was one on the north face of Mount Russ above Kootenay Inlet on the west coast. It extends from the 2,000-foot level near the summit to Russ Lake at its base. The margins of the runnel are bordered by *Chamaecyparis nootkatensis*, *Thuja plicata*, *Alnus crispa* ssp. *sinuata*, and *Tsuga heterophylla* and *T. mertensiana*. In crevices along rock walls and on cliff ledges are found such species as *Carex circinata*, *Lloydia serotina* ssp. *flava*, *Isopyrum savilei*, *Heuchera glabra*, *Saxifraga mertensiana*, *Aruncus sylvester*, *Geum calthifolium* and *G. schofieldii*, *Ligusticum calderi*, *Campanula alaskana*, *Luetkea pectinata*, *Sanguisorba canadensis* ssp. *latifolia*, *Cassiope lycopodioides* ssp. *cristapilosa*, and *Phyllodoce glanduliflora*. Along the margins and on boulders and rocky rubble along the runnel floor occur *Carex macrochaeta*, *Veratrum eschscholtzii*, *Montia parvifolia*, *Aquilegia formosa*, *Caltha biflora*, *Coptis asplenifolia*, *Ranunculus cooleyae* and *R. uncinatus*, *Cardamine umbellata*, *Parnassia fimbriata*, *Saxifraga ferruginea*, *S. punctata* and *S. lyallii* ssp. *hultenii*, *Tiarella trifoliata*, *Tolmiea menziesii*, *Rubus spectabilis*, *Viola glabella*, *Heracleum lanatum*, *Osmorhiza purpurea*, *Romanzoffia sitchensis*, *Mimulus guttatus* ssp. *guttatus*, *Sambucus pubens* ssp. *racemosa*, *Achillea millefolium*, *Prenanthes alata* and *Senecio triangularis*. In other runnels, such as those along the north face of Mount Moresby, there are not only many of the same species that occur on Mount Russ but also a number of species that are extremely rare on the Charlottes such as *Agrostis thurberiana*, *Arabis lyrata* ssp. *kamchatica*, *Arenaria stricta* ssp. *macra*, *Stellaria longipes*, *Ranunculus eschscholtzii*, *Draba lonchocarpa* ssp. *kamtschatica*, *Sibbaldia procumbens*, *Oxytropis campestris*, *Epilobium latifolium*, *Douglasia laevigata* ssp. *ciliolata*, *Artemisia arctica* and *Festuca prolifera*. There are many other subalpine and alpine species that occur in runnels and these include such species as *Poa stenantha*, *Vahlodea atropurpurea* ssp.

paramushirensis, *Saxifraga oppositifolia* and *S. taylori*, *Petasites nivalis*, *Calamagrostis purpurascens* ssp. *tasuensis*, *Phleum alpinum*, *Oxyria digyna*, *Anemone narcissiflora* ssp. *alaskana*, *Viola biflora* ssp. *carlottae*, *Cladothamnus pyrolaeflorus*, *Gentiana platypetala*, *Pedicularis oederi* and *P. ornithorhyncha*, *Veronica wormskjoldii*, *Senecio newcombei*, *Polystichum lonchitis*, *Thelypteris oreopteris*, *Carex scirpoidea*, *Mitella pentandra*, *Sedum rosea*, *Epilobium delicatum* and *Erigeron peregrinus*.



Figure 76. Mountain summit, rock cliffs and heath community above north end of Takakia Lake.

Of the many cliffs examined we found those above Takakia Lake to be especially rich in species (Figure 76). Here occur such species as *Calamagrostis purpurascens* ssp. *tasuensis*, *Carex circinata* and *C. macrochaeta*, *Lloydia serotina* ssp. *flava*, *Aquilegia formosa*, *Ranunculus cooleyae*, *Anemone narcissiflora* ssp. *alaskana*, *Heuchera glabra*, *Saxifraga mertensiana*, *S. oppositifolia* and *S. taylori*, *Lupinus nootkatensis*, *Geum calthifolium*, *Luetkea pectinata*, *Cassiope lycopodioides* ssp. *cristapilosa*, *Cladothamnus pyrolaeflorus*, *Isopyrum savilei*, *Pedicularis oederi* and *Viola biflora* ssp. *carlottae*. This partial list shows the similarity between plant communities of high montane cliffs and rock runnels at lower elevations. However, there are a few species that apparently occur only at high altitude. The only location for *Anemone parviflora*, *Erigeron humilis*, *Trisetum spicatum* and *Polypodium vulgare* ssp. *columbianum* is on cliffs along the south side of Takakia Lake (Figure 73). *Silene acaulis* ssp. *subacaulescens*, *Saxifraga oppositifolia* and *Salix reticulata* ssp. *glabellicarpa* are of local occurrence and

usually restricted to high montane cliff communities. Other cliff communities studied include those on Mount de la Touche above Fairfax Inlet, Yatza Mountain above Upper Victoria Lake, and Mosquito Mountain near the head of Cumshewa Inlet. Other types of rocky habitats are ridges and cols along the mountain summits. The plant communities of these windswept ridges and saddles are not especially rich in species even though they are without snow for a longer period of time during the growing season than meadows and heaths. The sparse and rather depauperate cover of the ridges contrasts sharply with the lushly vegetated meadow communities on protected montane slopes. Although plant communities of rocky exposures are not as extensive on the Queen Charlotte Islands as in the mainland mountainous regions, the number of montane taxa found on the Charlottes is large in proportion to the total flora.

Phytogeography

Floristic plant geography is concerned with past and present distribution patterns and with an analysis of plant dispersal, relationships and evolution. There are bound to be inherent physical and conceptual limitations. The physical difficulties include the time and energy that must be expended in trying to determine geographic ranges accurately, whereas the conceptual problems lie in the delimitation of taxa and in the elucidation of phylogenetic relationships. A valid appraisal of plant distribution patterns and their integration on a broad geographic basis requires not only a detailed floristic-taxonomic analysis for any given area but some understanding of the ecological and physiological response of plants to the environment and knowledge of the genetic constitution of the vegetation. The conclusions reached and hypotheses advanced with respect to endemism, isolation, disjunct populations and centers of evolution must ultimately be interpreted in the light of past and present climatic conditions, geological history, and the effects of other biological organisms.

The difficulties inherent in the taxonomic and geographic delimitation of taxa that are widely distributed in the circumboreal and circumpolar zones are nowhere more explicitly evident than in such works as Hultén's, *The Circumpolar Plants*, Part I, and *The Amphi-Atlantic Plants*. Many of the distributions are inaccurate on a regional basis, and others, especially in their central and eastern Asiatic sectors, are based on too few records for accurate depiction of ranges. Also, many taxonomists would disagree with his treatment of some species, especially the segregates recognized in a number of the more critical species complexes. However, so many diverse families and genera and such a large number of taxa make it hard to maintain a uniform taxonomic treatment. Phytogeographic studies that are broad in scope are inevitably subject to criticism. Although a marked increase in the number of detailed taxonomic studies has helped to clarify relationships in complex groups of species, especially at the infraspecific rank, and recent floristic surveys define the ranges of many taxa more accurately than past ones, a detailed phytogeographic analysis of the circumboreal and circumpolar zones is still not possible. However, despite these shortcomings, Hultén, in the face of many difficulties, has made by far the most important contributions to our knowledge of circumpolar plant distributions, their patterns and their development.

In 1953 the Plant Research Institute began surveys of British Columbia, Yukon and western Alberta by dividing the region into a number of areas. Work has continued regularly, and as a result the distribution patterns of most species of this region can now be quite well defined. Detailed distribution maps have been prepared for many species of the cordillera. They are based on the Institute's approximately 45,000 specimens of this region and 125,000 specimens from the herbaria of the University of British Columbia, Vancouver, the Provincial

Museum, Victoria, and the National Museum of Canada, Ottawa. The plotting of the ranges of a large number of species has enabled us not only to delimit the general configuration of the basic distributional types, but also to learn the floristic composition of these areas, and the direction of plant migration following the retreat of the Cordilleran ice sheet.

Analyses of present distributions

In order to analyze the distribution of the flora of the Queen Charlotte Islands maps were prepared for the 593 species and infraspecific taxa that occur there. The dot maps are based on about 6,000 collections and the many site observations that we recorded in our field notes during the two summer surveys. For each taxon the average number of stations is about 12, but this figure is considerably increased for the common, widely distributed native species. On the other hand, many of the introduced, montane and lowland elements are represented by only one or two collections. We believe that the number of collections available for study is adequate for defining and interpreting the regional distribution of most species. Further field work would not greatly increase the number of taxa reported for the Charlottes and any new discoveries would not radically alter our interpretation of the history and development of the vegetation in this region.

We have attempted to group the distributions of all indigenous species into basic patterns. Unfortunately it is not possible to define with complete accuracy the local ranges of a number of taxa. Some of the entities are at or near the southern or northern limit of their ranges and occur only sporadically, whereas others are wide-ranging species but have disjunct populations in the Charlottes and are not well represented in our collections, and still others, which are relics of a northward migration preceding or during the Hypsithermal, often occur only at isolated stations. Most of the species whose distributions are the most difficult to define and interpret are those restricted to the lowlands of eastern Graham and eastern Moresby islands. They are species usually found in the immediate vicinity of the coast in meadows, on open sea bluffs, or in open-forest habitats. The interior of the Queen Charlotte Lowlands and southern section of Skidegate Plateau is covered by dense coniferous forest with intermittent bogs and mires, and these areas have few suitable habitats for such species, except along river banks, on cliffs and on rocky hillsides where the forest is at least partially open. Many of these species, which are restricted to a coastal environment on the Charlottes and appear to have the same basic distribution pattern as a number of the obligate seashore species, actually extend far inland in the northwestern United States and are widely distributed in interior British Columbia. It is obvious that species confined to seashores cannot be referred to the same distributional type as species found both at the coast and far inland.

After comparing the individual distributions of the various taxa on the Charlottes we have been able to assign almost all of them to one of the following four general categories: wide-ranging, essentially lowland species that occur throughout or almost throughout the Islands; species that are restricted to the Queen Charlotte Ranges and mountainous areas of Skidegate Plateau or that also occasionally occur isolated in the lowlands along the eastern flanks of the

mountains or that occur as disjuncts in the Queen Charlotte Lowlands; species essentially restricted to seashore habitats; and species essentially restricted to the lowlands of eastern Graham and eastern Moresby islands. A number of distributional types that indicate natural floristic areas have been defined in the four categories. We would like to emphasize that all the taxa in any one of these categories or groups do not necessarily have the same basic distribution pattern when their total ranges are examined.

Wide-ranging species that occur throughout or almost throughout the Charlottes

There are 144 species and infraspecific taxa that we consider to be widely distributed throughout the Islands both at the coast and inland. These species occupy diverse habitats. Some extend from the coastal environment to well above tree line, many are elements of the extensive coniferous forests, others are species of bogs, mires and swamps, and still other occur in lakes and ponds or along their margins. We have arbitrarily placed in this category a number of the more poorly represented aquatics and semiaquatics, and also a small group of species for which there are no records in significantly large areas, but which we believe will eventually be found throughout the Islands. There are also a few species that are widely distributed in the coastal region but only occur sporadically inland. Most of the entities are represented by numerous collections and site records. No useful purpose would be served in recording all of them. The following 18 species are either not well represented by collections, or records of them are lacking from some areas:

Selaginella wallacei (not noted north of Towustasin Hill)
Equisetum variegatum ssp. *alaskanum* (sporadic occurrence)
Lycopodium inundatum (rare throughout its range in the Pacific Northwest)
Lycopodium obscurum (rare along British Columbia – Alaska Coast; not known from Vancouver Island)
Pteridium aquilinum var. *pubescens* (not noted in northern Graham or southern Moresby islands)
Juniperus communis (common in bogs of northeastern Graham Island; rare elsewhere)
Calamagrostis crassiglumis (sporadic occurrence)
Cinna latifolia (not noted in northern Graham or southern Moresby islands)
Poa laxiflora (not noted south of Kootenay Inlet)
Streptopus streptopoides ssp. *brevipes* (not noted south of Kootenay Inlet)
Corallorhiza maculata ssp. *mertensiana* (not noted south of northern Moresby Island)
Malaxis paludosa (not noted south of Kootenay Inlet)
Arceuthobium campylopodum (not noted south of Gray Bay)
Stellaria calycantha (not noted south of Takakia Lake)
Veronica americana (not noted south of Kaisun and Skidegate Lake)
Plantago major (probably represented by both native and introduced races)
Anaphalis margaritacea (occurs in both lowland and subalpine habitats; a weedy species; some east coast populations possibly represented by introduced plants)
Aster subspicatus (The taxonomy of the *A. subspicatus – A. foliaceus* complex is not clear; if two species are involved one has a coastal distribution and the other would be referred to the group that is restricted to the Queen Charlotte Ranges and Skidegate Plateau)

There are no records from the extreme northeastern section of Graham Island for a few of the wide-ranging species. This area is mantled by thick deposits of outwash sands and gravels (Brown, 1962, p. 213, Figure 2) that were

laid down at the time of the last major ice withdrawal and the lack of rock outcrops may account for the absence of some species. However, we did not adequately survey this region. A few of the following nine species may be present where there are suitable habitats:

Adiantum pedatum ssp. *aleuticum*
Cystopteris fragilis
Gymnocarpium dryopteris
Cardamine angulata
Tolmiea menziesii
Sorbus sitchensis ssp. *sitchensis*
Lupinus nootkatensis
Oplopanax horridus
Vaccinium alaskense

Finally, there are a few species that occur throughout the Islands but usually in open coastal habitats and only occasionally inland. This group is comprised of the following nine species:

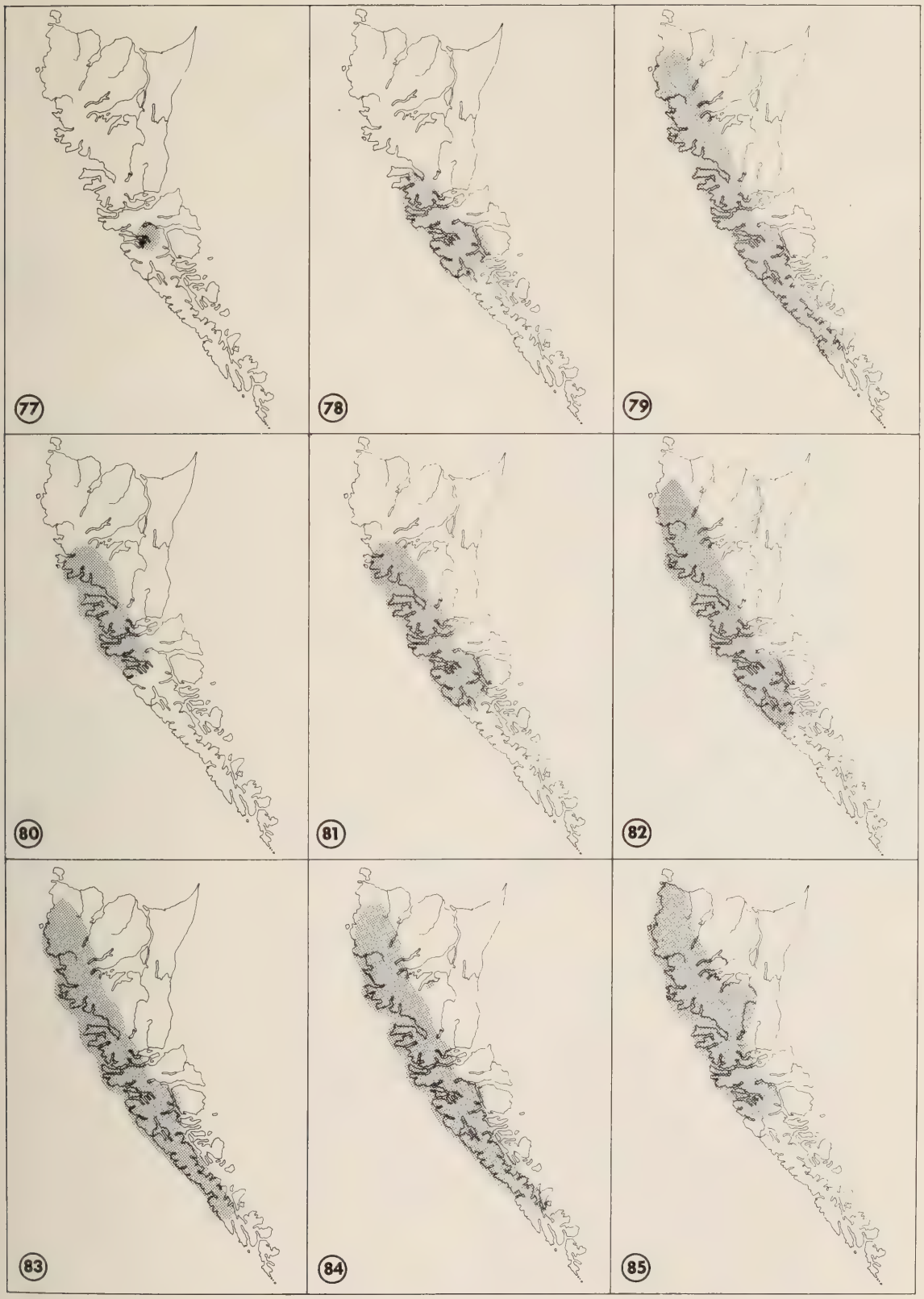
Agrostis exarata
Ribes bracteosum
Tellima grandiflora
Epilobium angustifolium
Oenanthe sarmentosa
Mimulus guttatus ssp. *guttatus*
Galium trifidum
Lonicera involucrata
Sambucus racemosa ssp. *pubens*

Species essentially restricted to the Queen Charlotte Ranges and mountainous areas of Skidegate Plateau

In this category, which comprises mainly montane elements, there are 122 species and infraspecific taxa. This group is of special interest as it includes *all* the endemics of the Queen Charlotte Islands. In addition, there are a number of species that are represented by disjunct populations, and others that are at or near the southern or northern limits of their ranges in western North America. There are 81 montane species restricted to the Queen Charlotte Ranges and mountainous areas of Skidegate Plateau. Some of these montane elements are widely distributed and extend from the low mountains near the head of Flamingo Inlet at the southern end of Moresby Island north to the peneplained summit of Skidegate Plateau near Jalun Lake, others are restricted to the Queen Charlotte Ranges between Shields Bay and Tasu Sound, and still others are confined to the highest mountain mass on the Islands which is between the heads of Cumshewa, Peel and Sewell Inlets, and Security Cove. There could be a further refinement for groups of species but the areas circumscribed are the most important phytogeographically. As the boundaries of the mountainous areas have been arbitrarily chosen, the ranges of all the montane elements do not conform exactly with the areas as delineated. At these boundaries, both north and south of the core of the Queen Charlotte Ranges (52°55′N to 53°05′N), there is a marked increase in the ruggedness of the topography and the height and extent of the mountain masses. The number of montane species that occur in each of the three areas can be directly correlated with the changes in topography.

The most restricted distributions are those of 21 species (Figure 77) that occur only in an area bounded by Mount Moresby, Mosquito Mountain and the mountains around Takakia Lake. In this group are:

Polypodium vulgare ssp. *columbianum*
Agrostis thurberiana
Trisetum spicatum
Arabis lyrata ssp. *kamchatica*
Cardamine bellidifolia
Draba lonchocarpa ssp. *kamtschatica*



Figures 77-85. Distribution patterns of the endemics of the Queen Charlotte Islands and taxa that are restricted to the Queen Charlotte Ranges (see text for elaboration). Figure 83 indicates the distribution pattern of *Calamagrostis purpurascens* R. Br. ssp. *tasuensis* Calder & Taylor, *Lloydia serotina* (L). Reichenb. ssp. *flava* Calder & Taylor, *Viola biflora* L. ssp. *carlottae* Calder & Taylor, *Cassiope lycopodioides* (Pall) D. Don ssp. *cristapilosa* Calder & Taylor, and *Senecio newcombei* Greene.

Carex enanderi
Arenaria stricta ssp. *macra*
Stellaria longipes
Aconitum delphinifolium
Anemone parviflora
Ranunculus eschscholtzii
Ranunculus pygmaeus
Thalictrum alpinum
Sibbaldia procumbens
Sorbus sitchensis ssp. *grayi*
Oxytropis campestris
Epilobium latifolium
Douglasia laevigata ssp. *ciliolata*
Artemisia arctica
Erigeron humilis

The second group includes species (Figure 78) that extend from the mountains bordering Shields Bay at the head of Rennell Sound south to Mount de la Touche near the head of Fairfax Inlet off Tasu Sound. This group comprises the following 23 species:

Festuca prolifera
Poa leptocoma
Poa stenantha
Vahlodea atropurpurea ssp. *paramushirensis*
Carex pyrenaica ssp. *micropoda*
Juncus drummondii
Juncus mertensianus
Luzula parviflora (alpine phase)
Leptarrhena pyrolifolia
Saxifraga lyallii ssp. *hultenii*
Saxifraga oppositifolia
Saxifraga punctata ssp. *cascadensis*
Saxifraga tolmiei
Sanguisorba canadensis ssp. *latifolia*
Hippuris montana
Cassiope mertensiana
Swertia perennis
Castilleja parviflora
Pedicularis lanata
Campanula lasiocarpa
Hieracium triste
Petasites nivalis
Solidago multiradiata

A third group of species (Figure 79) comprises the more widespread montane elements of the Queen Charlotte Ranges and Skidegate Plateau and includes all the endemics (in bold face) of the Charlottes except *Saxifraga taylori*. About two thirds of the 37 taxa were found on Yatza Mountain above Upper Victoria Lake and in alpine habitats near Jalun Lake or in both places. Species with the most extensive distributions are:

Lycopodium sabinaefolium ssp. *sitchense*
Tsuga mertensiana
Calamagrostis purpurascens ssp. **tasuensis** (Figure 83)
Phleum alpinum
Carex circinata
Carex macrochaeta
Lloydia serotina ssp. **flava** (Figure 83)
Oxyria digyna
Anemone narcissiflora ssp. *alaskana*
Isopyrum savilei (Figure 82)
Ranunculus cooleyae
Saxifraga punctata ssp. *carlottae*
Geum calthifolium
Luetkea pectinata
Viola biflora ssp. **carlottae** (Figure 83)
Viola langsdorffii
Cassiope lycopodioides ssp. **cristapilosa** (Figure 83)
Cassiope stelleriana
Cladothamnus pyrolaeflorus
Phyllodoce glanduliflora
Gentiana platypetala
Pedicularis oederi
Veronica wormskjoldii
Arnica latifolia
Senecio newcombei (Figure 83)

The remaining 12 species in the third group are of more limited range and do not extend to either the northern end of Skidegate Plateau or the southern end of the Queen Charlotte Ranges. Two species, *Thelypteris oreopteris* and *Carex scirpoidea*, have distribution patterns almost similar to those of group two but they extend slightly farther south. In this group are:

Polystichum lonchitis
Thelypteris oreopteris
(Shields Bay to Sunday Inlet)
Carex nigricans
Carex scirpoidea
(Skidegate Channel to Echo Harbour)
Salix reticulata ssp. **glabellicarpa**
(Figure 81)
Silene acaulis ssp. *subacaulescens*
Geum schofieldii (Figure 81)
Pedicularis ornithorhyncha
Pedicularis pennellii ssp. **insularis**
(Figure 80)
Polygonum viviparum
Pedicularis verticillata
Senecio triangularis

There is also a fourth group comprising 13 montane species that either have disjunct lowland stations (indicated in parentheses) along the flanks of the mountains of Skidegate Plateau or occur isolated in the Queen Charlotte Lowlands. Most of these species are widely distributed throughout the mountainous regions of the Charlottes. In this group are:

Lycopodium selago ssp. *selago*
(White Creek Muskeg)
Habenaria chorisiana
(Langara Island)
Caltha biflora
(Blackwater Creek)
Mitella pentandra
(Towustasin Hill)
Parnassia fimbriata
(Yakoun Lake)
Saxifraga taylori (Figure 85)
(Towustasin Hill)
Tiarella unifoliata
(Langara Island, Yakoun River)
Epilobium anagallidifolium
(Skidegate Lake region)
Ligusticum calderi
(Towustasin Hill)
Romanzoffia sitchensis
(Towustasin Hill)
Mimulus guttatus ssp. **haidensis**
(Figure 84) (Lepas Bay, Yakoun River, Mamin River delta)
Valeriana sitchensis
(Towustasin Hill)
Arnica amplexicaulis
(Blackwater Creek, Yakoun Lake, Honna River)

Finally there is a somewhat heterogeneous group comprising essentially lowland elements, but including species that also extend into the subalpine or alpine zones. Although most of these species are confined to the lowlands of the mountainous regions, some occur sporadically along the eastern flanks of the mountains, and others extend to the Queen Charlotte Lowlands. This group is represented by the following 28 taxa:

Lycopodium selago ssp. *miyoshianum*
Mecodium wrightii
Asplenium trichomanes
Asplenium viride
Cryptogramma crispa ssp. *acrostichoides*
Polystichum braunii ssp. *alaskense*
Polystichum braunii ssp. *andersonii*
Polystichum braunii ssp. *purshii*
Thelypteris phegopteris
Sparganium hyperboreum
Danthonia intermedia
Melica subulata
Juncus triglumis
Veratrum eschscholtzii
Habenaria unalascensis ssp. *unalascensis*
Alnus crispa ssp. *sinuata*
Montia parvifolia
Cerastium fischerianum
Sedum rosea
Heuchera glabra
Saxifraga ferruginea
Saxifraga mertensiana
Aruncus sylvester
Epilobium delicatum
Osmorhiza purpurea
Galium kamtschaticum
Erigeron peregrinus
Senecio cymbalarioides ssp. *moresbiensis*

Species essentially restricted to seashores

All the 72 species and infraspecific taxa in this category tolerate saline or brackish conditions and, although most occur only on the sea coast, a few are

also occasionally found inland in open nonsaline habitats. Many are distributed along all shorelines of the Islands, whereas others, much affected by local edaphic conditions, occur only here and there. Some are elements of meadows, marshes or open mud flats; others occur on sand, gravel or shingle beaches; a few are confined to rocky shorelines, and two are strictly marine. The marked diversity in habitat accounts for the different assemblages of species that occur on fairly long stretches of both the east and west coasts. There are 28 common and widely distributed species that are restricted to shorelines on the Charlottes. Some of these are strictly coastal throughout their entire ranges. Others such as *Triglochin maritimum*, *Hordeum brachyantherum*, *Lathyrus japonicus* and *Galium aparine* occur inland. The 28 species in this group are as follows:

Phyllospadix scouleri
Zostera marina
Triglochin maritimum
Bromus pacificus
Elymus mollis
Festuca rubra (occasionally introduced inland along roadsides)
Hordeum brachyantherum
Puccinellia pumila
Carex lyngbyei
Polygonum fowleri
Rumex transitorius
Atriplex patula ssp. *obtusa*
Salicornia pacifica (rare on west coast)
Arenaria peploides ssp. *major*
Sagina maxima
Spergularia canadensis
Stellaria humifusa
Arabis hirsuta ssp. *eschscholtziana*
Cakile edentula
Cochlearia officinalis ssp. *oblongifolia*
Fragaria chiloensis
Potentilla pacifica
Lathyrus japonicus
Conioselinum pacificum
Ligusticum scoticum ssp. *hultenii*
Glaux maritima ssp. *obtusifolia*
Plantago maritima
Galium aparine (introduced inland)

A second group comprises the following nine species, which are widely distributed but of sporadic occurrence or not represented by records from some areas:

Puccinellia nutkaensis (not noted south of Gray Bay and Chaatl Narrows)
Carex glareosa (sporadic occurrence)
Carex gmelinii (sporadic occurrence)
Juncus arcticus ssp. *sitchensis* (absent from northeast Graham Island, where it is replaced by the allopatric ssp. *ater*)
Montia fontana (only recorded from Graham and northern Moresby islands)
Ranunculus occidentalis (absent from northeast Graham Island, where it is replaced by the allopatric *R. orthorhynchus*)
Draba hyperborea (not present along the east and north coasts of Graham Island from Skidegate to Masset because of the lack of suitable habitats)
Trifolium wormskjoldii (not noted along the north and northeast coasts of Graham Island)
Vicia gigantea (not noted south of Louise Island)

A third group of species is widely distributed along the coasts of the Islands, but occasionally these species also occur inland on open habitats such as lake shores and river margins, in bogs and on alpine cliffs and slopes. This group might be placed in the category containing the wide-ranging elements that occur throughout the Islands, but they are more appropriately included with the coastal species. The 11 taxa in this group are:

Calamagrostis nutkaensis (lowland lake and river shores)
Deschampsia caespitosa ssp. *beringensis* (lake shores; alpine slopes)

Elymus glaucus (subalpine runnels)
Fritillaria camschatcensis (alpine slopes; bogs)
Sisyrinchium littorale (lowland lake shores)
Barbarea orthoceras (alpine—subalpine runnels and cliffs)
Potentilla villosa (alpine—subalpine runnels)
Angelica lucida (alpine rock bluffs)
Lilaeopsis occidentalis (lowland lake shores)
Castilleja unalaschensis (rocky alpine bluffs)
Plantago macrocarpa (lowland lake shores)

There is also a small group of species that grow in isolated spots because of the lack of suitable habitats along most of the coastline of the Charlottes. Such species are confined to the only areas where there are extensive sand, gravel or shingle beaches, that is, between Gray Bay in northeast Moresby Island and Lepas Bay at the northwest tip of Graham Island. This group comprises the following 13 species (Figure 86):

Poa douglasii ssp. *macrantha*
Carex arenicola ssp. *pansa*
Carex macrocephala
(introduced at Mayer Lake)
Juncus leseurii
Abronia latifolia
Lathyrus littoralis
Lupinus littoralis
Glehnia littoralis ssp. *leiocarpa*
Convolvulus soldanella
Amsinckia spectabilis
Franseria chamissonis f. *bipinnatisecta*
(introduced at Port Clements)
Senecio pseudo-arnica
Tanacetum huronense
(introduced at Mayer Lake)

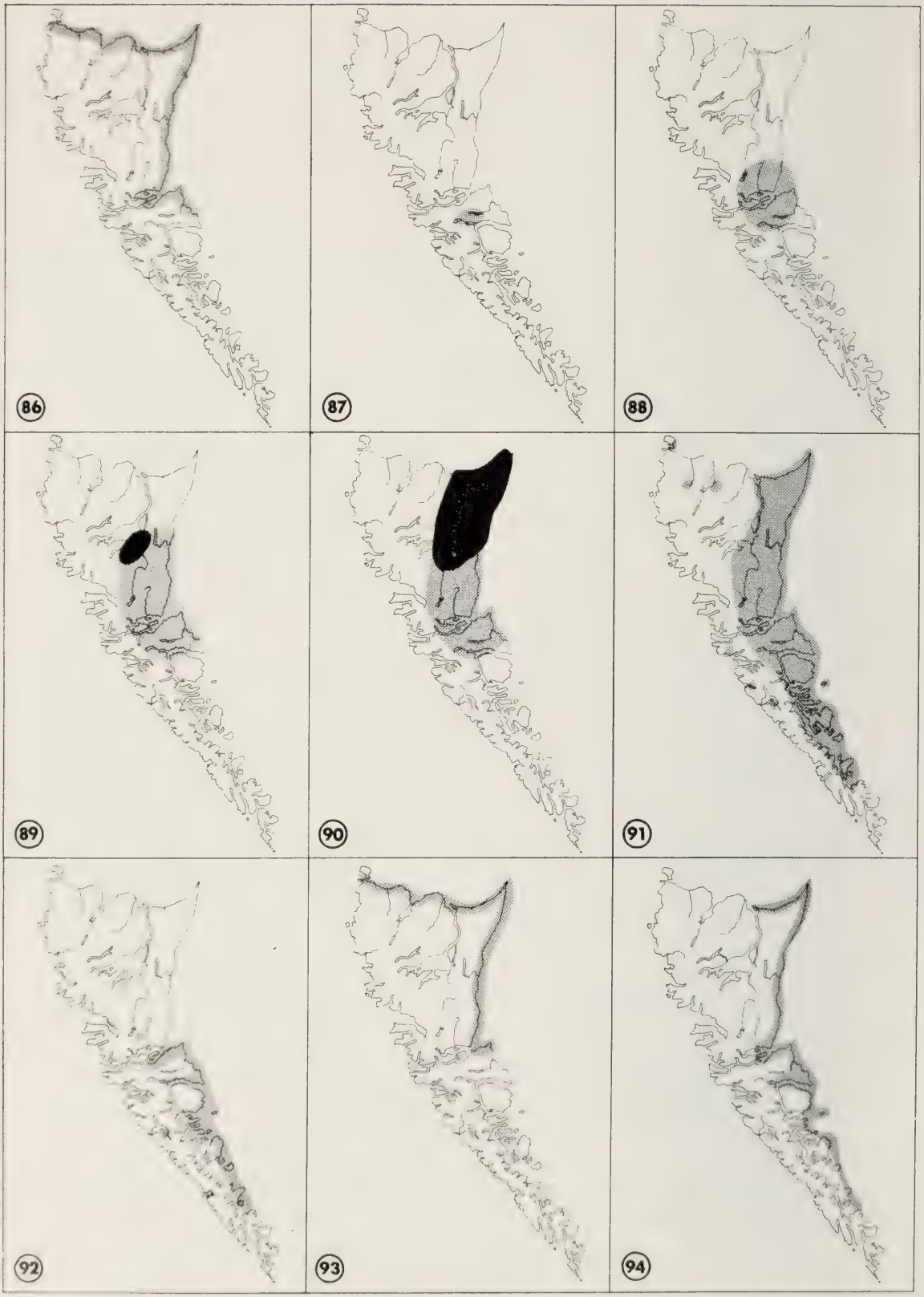
Poa confinis, which extends as far south as South Low Island on the east coast, and *Mertensia maritima*, which is known from Sisk near Frederick Island on the west coast, have almost the same basic distribution patterns as these 13 seashore species. One other group that is apparently confined to the shorelines of the eastern section of the Islands comprises mainly species that occur in saline marshes, in meadows and on mud flats. There are such habitats at the heads of a few of the larger more protected bays and inlets on the west coast, but they are of limited extent in comparison to the marshes and meadows at the mouths of the Tlell, Yakoun and Naden rivers, and Kumdis Creek. In this group are the following eight taxa:

Ruppia maritima
Bromus sitchensis (introduced at Kaisun)
Puccinellia borealis (rare)
Scirpus cernuus (Masset Inlet only)
Juncus arcticus ssp. *ater* (northeastern Graham Island only)
Suaeda depressa (eastern Graham Island only)
Ranunculus orthorhynchus (eastern Graham Island only)
Grindelia integrifolia (not noted south of Outer Skedans Island)

One species, *Polypodium scouleri*, is at the northern limit of its range on Anthony Island near the southern end of the Charlottes.

Species essentially restricted to the lowlands of eastern Graham and eastern Moresby islands

Most of the 115 species and infraspecific taxa in this category are confined to the Queen Charlotte Lowlands and the southeastern section of Skidegate Plateau. A few range farther south along the east coast of Moresby Island, others extend to Langara Island or Lepas Bay near the northwest tip of Graham



Figures 86-94. Distribution patterns of taxa that are restricted to either seashores or essentially to the lowland sections of eastern Graham and Moresby islands (see text for elaboration).

Island, and a small group is found in isolated stations on the west coast. Almost all the species in this category are restricted to open habitats. Those that occur inland are found in open forest, marshes, mires and bogs, along lake shores and along river margins, whereas those that are restricted to the immediate vicinity of the coast occur on open sea bluffs, in meadows and in open-forest habitats. We have been able to delimit accurately the ranges of a number of species but others are of such scattered occurrence and are represented by so few collections that we are unable to define or interpret their distributions. Many of these lowland elements, especially those that are at or near the limit of their range and occur in moderately dry open coastal habitats, probably did not reach the Charlottes until the coniferous forest was well established after deglaciation. Presumably, under the more favorable climatic conditions that prevailed during the Hypsithermal there were many available habitats for these species and a number were probably more widely distributed along the east coast than they are today. At the present time, many of these coastal elements are of local occurrence and they occupy a variety of ecological niches. Although there are a few suitable habitats inland for such species, few have been able to penetrate the dense coniferous forests that extend almost to the ocean margin in most places. In spite of the fact that the species in this category have such varied distributions it is possible to define a number of basic patterns which to some degree indicate natural floristic areas and which have helped us in interpreting the vegetational history of the region.

When the ranges of all these lowland elements are compared, the greatest concentration of species is seen to be in extreme southeast Graham Island and the northeast sections of Moresby Island. The reason for this preponderance is that here, in the rain-shadow of the highest mountains on the Islands, there is the greatest diversity of habitats. As with the montane elements, the number of species decrease toward the north and south extremities of the Charlottes. We have been able to distinguish a number of fairly well defined basic distribution patterns in both the coastal members and the widely distributed elements of the eastern lowlands of the Islands. The first group comprises the following 10 species (Figure 87) which are restricted to Mosquito and Skidegate lakes and their shorelines:

Equisetum palustre
Potamogeton robbinsii
Elodea canadensis
Danthonia californica
Festuca myuros
Carex arcta
Eleocharis acicularis
Eleocharis obtusa
Subularia aquatica ssp. *americana*
Lycopus uniflorus

A second group is confined to a region bounded by Yakoun Lake, Jungle Beach, Sandspit, Copper Bay, Gillatt Arm, and Mosquito Lake. The following 11 taxa (Figure 88) are in this group:

Equisetum fluviatile
Potamogeton richardsonii
Tofieldia glutinosa ssp. *brevistyla*
Salix lasiandra
Actaea rubra ssp. *arguta*
Ranunculus flammula var. *flammula*
Ranunculus flammula var. *filiformis*
Crataegus douglasii
Myriophyllum spicatum
Pyrola secunda
Lobelia dortmanna

A third group of 22 species (Figure 89) is roughly restricted to an area bounded by Juskatla, Port Clements, Tlell, Cumshewa Inlet and Gillatt Arm. The following five species in this group occur only in the Juskatla–Port Clements region (solid area):

Lycopodium complanatum
Carex brevicaulis
Carex tracyi
Scirpus atrotinctus
Lathyrus ochroleucus

The other 17 taxa in this group are as follows (solid plus shaded areas):

Equisetum hyemale ssp. *affine*
Equisetum telmateia
Sparganium minimum
Potamogeton gramineus
Calamagrostis canadensis
Festuca occidentalis
Glyceria occidentalis
(not noted south of Yakoun Lake)
Carex macloviana ssp. *pachystachya*
Salix sitchensis
Ranunculus aquatilis
Ribes lacustre (essentially coastal; extends south to South Low Island)
Circaea alpina ssp. *alpina*
Circaea alpina ssp. *pacifica*
Cornus stolonifera
Mentha arvensis
Veronica scutellata
Viburnum edule

A fourth group comprises 22 species (Figure 90) and infraspecific taxa that are widely distributed within an area bounded essentially by Gillatt Arm and Cumshewa Inlet on the south, Masset, Juskatla and Yakoun and Mosquito lakes on the west, and the north coast of Graham Island. The 22 taxa in this group are as follows (solid plus shaded areas):

Potamogeton berchtoldii ssp. *berchtoldii*
Potamogeton berchtoldii ssp. *tenuissimus*
Potamogeton epihydrus
Agrostis scabra
Torreychloa pauciflora
Carex cusickii
Carex disperma
(not noted on Moresby Island)
Carex exsiccata (Jalun Lake)
Eleocharis macrostachya
Eriophorum chamissonis × *E. russeolum*
Scirpus lacustris ssp. *glaucus*
(not noted on Moresby Island)
Scirpus sylvaticus
(extends west to Naden Harbour)
Juncus filiformis
Goodyera oblongifolia
Spiranthes romanzoffiana
Cardamine occidentalis
Potentilla palustris
Rubus chamaemorus
Epilobium brevistylum
Osmorhiza chilensis
Spiraea douglasii ssp. *menziesii*
Myosotis laxa

A fifth group comprises the following seven species (Figure 90), which are restricted to the northeast section of Graham Island (solid area only):

Carex brunnescens
Eleocharis kamtschatica
Juncus articulatus
Ranunculus hyperboreus
Epilobium palustre
Hippuris vulgaris
Pinguicula villosa

The sixth group comprises 13 species and infraspecific taxa that either extend farther south than any of the species in the preceding five groups, or have one or two isolated stations west of the Queen Charlotte Ranges, or occur in the northwest section of Skidegate Plateau (Figure 91). This is a somewhat heterogenous group and possibly some of the taxa should be referred to other categories. These species and their disjunct stations are as follows:

Botrychium multifidum (Upper Victoria Lake)
Deschampsia elongata (Horn Rock)
Carex canescens (Kootenay Inlet, Langara Island)
Carex deweyana ssp. *leptopoda* (Kaisun; introduced?)
Carex sitchensis (Langara Island, Jalun Lake)
Eriophorum chamissonis (Langara Island, Jalun Lake)
Juncus ensifolius (Langara Island, Upper Victoria Lake)
Juncus falcatus (Upper Victoria Lake)
Myrica gale (Upper Victoria Lake)
Coptis trifolia (Langara Island)
Cardamine pensylvanica (Langara Island)
Rosa nutkana (Langara Island, Kaisun)
Stachys cooleyae (Kaisun, Langara Island; introduced? both areas)

The remaining 29 taxa in this category are mostly confined to habitats along the north and east coasts. The following 13 species (Figure 92) are strictly coastal and occur within an area bounded by Tlell in the north and East Copper Island off the southeast coast of Moresby Island:

Festuca megalura
Habenaria unalascensis ssp. *maritima*
Anemone multifida
Sedum divergens
Heuchera chlorantha
(extends west to Dawson Harbour)
Amelanchier florida (extends west to Long Inlet in Skidegate Inlet)
Geranium richardsonii
Epilobium minutum
Sanicula crassicaulis
Polemonium pulcherrimum
Rhinanthus crista-galli
Symphoricarpos albus
Solidago canadensis

There are five other species (Figure 92) that occur within the region defined for the preceding group but these species have stations either inland or on the west coast.

Cerastium arvense (Towustasin Hill)
Saxifraga caespitosa (Towustasin Hill)
Arctostaphylos uva-ursi (Yakoun Lake)
Collinsia parviflora (Tasu Sound)
Plectritis congesta (Kaisun, Gowgaia Bay)

A third group, comprising the following five species (Figure 93), is restricted to coastal habitats from Lepas Bay at the northwest tip of Graham Island to the Sandspit area in northeastern Moresby Island:

Hierochloë odorata (also in Masset Inlet)
Arenaria lateriflora
Viola adunca
Gentianella amarella ssp. *acuta*
Hieracium albiflorum

In addition, a few species (Figure 94) are widely distributed along the north and east coasts between Masset and the southern end of Moresby Island. In this group are the following species:

Agrostis pallens
Calypso bulbosa ssp. *occidentalis*
Salix scouleriana
Cardamine oligosperma (isolated at Towustasin Hill)
Geum macrophyllum (Juskatla)
Castilleja hyetophila

We have not been able to interpret the local distribution of the remaining 16 taxa. Three species, *Salix hookeriana*, *Rubus ursinus* and *Veronica peregrina* var.

xalapensis (as a native), are represented only by single stations in extreme southern Moresby Island, and are apparently at the northern limit of their range along the west coast of North America.

Distributional affinities of the indigenous plants of the Queen Charlotte Islands

To determine the relationships of the indigenous flora of the Queen Charlotte Islands with other regions of the world, we plotted ranges of most of the 476 native taxa that occur on the Islands. Those taxa that have an established circumpolar-circumboreal distribution, and four other taxa whose distributions were inadequately known, were not plotted. Table 15 summarizes, on a continental basis, the distributional affinities of 472 indigenous taxa found on the Islands.

Table 15. Distributional affinities of indigenous taxa of the Queen Charlotte Islands

Distribution	Taxa	Percent of Flora
North American only	242	51.3
North American and Asian	89	18.9
North and South American	4	0.8
North American, European and South American	1	0.2
Circumpolar—Circumboreal	136	28.8
Total	472	

It is quite evident from Table 15 that the flora of the Islands is mainly composed of North American elements. The five taxa that have distributions including the southern hemisphere are all coastal-strand species. If the North American element of the flora is analyzed (Table 16), it becomes quite clear that this large segment of the flora contains a high percentage of maritime coastal elements.

Development of the present flora based on distributional patterns and glacial history

Because of its glacial history the Cordilleran region of British Columbia is a unique area in North America for studies of plant migration and distribution patterns. The glacial maps of North America (Flint, 1945) and Canada (Geological Association of Canada, 1958) show that the entire province including the Queen Charlotte Islands was covered by an ice sheet at the time of maximum ice advance during the Wisconsin glaciation. To the south the ice sheet advanced as far as northern Washington, Idaho and Montana, but the Olympic Mountains of Washington and extensive areas in the Cascade Mountains escaped glaciation. The complexity and degree of glaciation in the Cascades precludes any attempt to clearly define the extent of these areas. On the eastern flank of the Rocky Mountains in extreme southwestern Alberta one small ice-free area is indicated along the line of impingement of the Cordilleran and Keewatin ice sheets. According to Stalker (pers. comm.) of the Canadian Department of Energy, Mines and Resources there is also another relatively small area in the foothills east and northeast of Banff that may have escaped glaciation. To the north, in

Table 16. Distributional affinities of indigenous North American taxa on the Queen Charlotte Islands

Distribution			Taxa	Percent of Flora
Pacific Coastal elements			94	38.8
Q.C.I. endemics	11	4.5		
Q.C.I. and adjacent Alaska—B.C. coast	6	2.5		
Alaska panhandle to Wash., Ore., or Calif.	37	15.3		
Aleutian Is. or Gulf Alaska to Wash., Ore., or Calif.	40	16.5		
Wide-ranging Cordilleran elements			98	40.5
Wide-ranging North American elements			50	20.7
Total			242	

western Yukon and central Alaska, there is extensive terrain that was not glaciated, and there is increasing botanical and geological evidence that two areas along the east flanks of the Mackenzie Mountains may have been entirely ice-free at the time of maximum glaciation. Geological surveys along the British Columbia coast indicate that the lowlands and mountain ranges with the exception of the higher peaks were glaciated during Wisconsin time. The Cordilleran ice sheet overrode the lower ranges of the Coast Mountains and funneled through the east-west-trending valleys where it formed piedmont glaciers that coalesced with minor ice sheets that were centered along the spines of the main mountain masses of the Queen Charlotte Islands and Vancouver Island.

Our botanical investigations of the flora of the Pacific Northwest support the geological evidence that the Cordilleran ice sheet extended to the southern, northern and eastern boundaries of British Columbia at the time of maximum Wisconsin glaciation, but we have reservations as to the extent of glaciation in the Queen Charlotte Islands. The present-day distribution of all higher plant species in British Columbia that we have critically examined, with the exception of the endemics and some disjuncts from the Queen Charlotte Islands, can be correlated with the sequence of geological events that took place under the climatic conditions that prevailed in late-Wisconsin time. It is significant that the size of the refugia bordering Cordilleran ice is directly related to the number of disjunct species and degree of speciation found in these areas. Our surveys of the vegetation of the Queen Charlotte Islands do not support the statement by Brown and Nasmith (1962, p. 218) that "probably not more than 3.5 miles of the land surface stood above the glacier ice" at the time of maximum glaciation. Such a small land area, represented only by nunataks above the 3,000-foot level, would have been subjected to montane glaciation and have received the full force of the rigorous climate that must have prevailed. Ice-free areas of such limited extent are extremely unlikely to have provided a suitable environment for vascular plants.

It is much more logical to support the viewpoint of Heusser (1960, p. 201), who stated that refugia undoubtedly occurred along the Pacific side of Moresby and Graham islands on the slopes and along the headlands. Such open land

masses would have been able to exist through the maximum glaciation because the orographic features and the presence of great depths of water immediately adjacent to the coast would prevent the ice from accumulating and spreading laterally. Dahl (1946*a* and *b*) indicated that similar conditions presumably enabled the establishment of refugia along the western coast of Norway.

The topographic features of the Islands and the detailed knowledge of glaciation provided by Brown and Nasmith (1962) can be coupled with the high degree of biological endemism. The presence of plant taxa that have widely disjunct populations and the analysis of distribution patterns of the various taxa that occur on the Charlottes clearly indicate that there was a major biological refugium on the Islands during the last glaciation. We believe that even at the height of the Wisconsin glaciation there were probably extensive areas ice-free and open for plant colonization. Such a hypothesis would in part account for the mammal endemism discussed recently by Foster (1965).

The development of the present flora, then, begins with the spread of the plants that persisted in the refugia after the initial stages of retreat of the coastal glaciation. It is curious that many of the endemics on the Islands were unsuccessful in migrating to the mainland. Such species as *Isopyrum savilei* and *Senecio newcombei* would not be overlooked by collectors, so their absence cannot be attributed to a collecting gap. This raises the question of what species did migrate from the Islands' refugium to the coastal region of the mainland. *Ligusticum calderi* has been found in the adjacent coastal area and undoubtedly some of the other endemics may occur in this region. It appears that the only successful migrants from the Islands would be those species that persisted on the western headlands or valley refugia but are now widespread and inhabit the eastern slopes of the Queen Charlotte Ranges.

Undoubtedly the first migration *to* the Islands occurred from the south when the entire coastal area became ice-free following retreat of the main Coastal Mountain glaciation. The role that this northward migration played in the development of the flora is difficult to ascertain, but undoubtedly some of the lowland elements arrived with this migration. Such taxa as *Fragaria chiloensis*, *Lathyrus littoralis*, *Carex macrocephala* and *Abronia latifolia* could have spread to the Islands during this northward migration. A southward migration of coastal plants probably occurred at a later date from the Beringia refugium. Such migrants as *Draba hyperborea*, *Carex gmelinii*, *Carex glareosa*, *Cerastium fischerianum*, *Mertensia maritima*, *Ligusticum scoticum* ssp. *hultenii* and *Senecio pseudo-arnica* are probable examples of taxa that moved southward along the coast of Alaska to the Queen Charlotte Islands.

During the postglacial a general warming period called the Hypsithermal occurred. Many plant species previously restricted to warmer regions south of the Queen Charlottes or to the interior regions of mainland British Columbia were able to migrate northward or westward. Today, the flora of the Islands still contains a few remnants of a much more widespread distribution during the Hypsithermal. Such taxa as *Sanicula crassicaulis*, *Epilobium minutum*, *Heuchera chlorantha*, *Danthonia californica*, *Saxifraga caespitosa*, *Polemonium pulcherrimum*, *Geranium richardsonii* and *Anemone multifida* are examples. It is worthy of note that at least three of these species (*P. pulcherrimum*, *G. richardsonii*, and

A. multifida) are now found only along the bluffs of Limestone Island (Figure 95). The severe restriction of these species to a single locality suggests that they have been able to survive on the Queen Charlotte Islands since the Hypsithermal because of the lack of competition at this site. Under the more common edaphic conditions on the Islands, such species would not have been able to persist.

The present flora has some curious absences similar to those found in the fauna. It is surprising that *Phyllodoce empetriformis*, *Populus trichocarpa*, *Abies lasiocarpa* are absent, and that *Pyrola secunda* is not more abundant. There would appear to have been a limited movement of plants onto the Island archipelago following the Hypsithermal, except for those arriving by bird or through the help of man. The introduced plants, now about 20 percent of the total flora, have been carried to the Islands almost exclusively by man or his contrivances. There is some evidence that a few native plants were carried between various villages on the Charlottes by the Haidas even before 1900.

Conclusions

From our phytogeographical findings we believe that the indigenous flora of the Queen Charlotte Islands was to a large degree maintained in refugia on the headlands and along the fiords of the west coast during maximum Pleistocene glaciation. The presence of refugia is supported by the existence of clear-cut endemics, by several examples of disjunct distributions and finally by the patterns of distribution of the indigenous taxa. The analysis of native plants shows that the Queen Charlotte Islands represent a center of postglacial plant radiation

Figure 95. The east end of Limestone Island off the east coast of Moresby Island.



similar to the examples given by Hultén (1937*b*) in his discussion of the theory of equiformal progressive area. In the postglacial period subsequent migrations from the south and north took place along the Pacific coast. In addition, a second wave of migrants, the Hypsithermal elements, also invaded the Queen Charlotte Islands. Subsequent lowering of the mean annual temperatures has left isolated pockets of these elements stranded on the mesic sites along the east coast and a few drier inland sites. In recent historical times, introduced taxa have increased the flora about one quarter.

The history of the development of the flora is not easily deduced and a number of nagging questions remain to be answered. How widespread were the endemic species before glaciation? Do the endemics represent end products of speciation as a result of insular isolation or do they represent remnants of once more-widespread preglaciation taxa? If we correctly assume that migration to the Islands has occurred, why are some common adjacent mainland species absent? These questions, and many others, will probably never be answered satisfactorily.

Systematics

PLAN OF THE FLORA

The 277 genera included in this flora belong to the division Tracheophyta. Three subdivisions are represented on the Queen Charlotte Islands, namely, Sphenopsida, Lycopsida and Pteropsida. The last subdivision, which contains most of the genera included in the flora, is further subdivided into three classes: Filicinae, Gymnospermae and Angiospermae. The last class contains the two subclasses Monocotyledonae and Dictoyledonae. This classification of the chief groups of vascular plants has not been widely used by taxonomists, although the findings of modern morphologists working on both neobotanical and paleobotanical problems support it (Foster and Gifford, 1959; Delevoryas, 1962).

Lawrence (1951) has been the guide for family names and their sequence, which is based on the Englerian system. We have not split such families as the Liliaceae and Saxifragaceae into some of the well-known segregate families. In the Angiospermae the monocotyledonous families precede the dicotyledonous, the latter ending with the Compositae.

In all but a few cases the keys have been based solely on collections from the Queen Charlotte Islands. Vegetative characters have been used whenever possible, except in the key to families, where flower and fruit characters have been included. All keys are artificial and do not reflect natural relationships.

We have included in the synonymy of each species only those names that are or have been used for taxa in the Queen Charlotte Islands and the adjacent Cordilleran region. No attempt has been made to record all synonyms. New taxa and new combinations have been proposed in separate papers and none are reported for the first time in the text of this flora. References to the places of publication of all taxa are included. Introduced species are indicated by an asterisk. Consistency of abbreviation of authorities, and of places and dates of publication, has been greatly facilitated by the use of several references, of which the following are the most important: Schwarten and Rickett (1958, 1961), van Steenis (1954), and Tutin *et al.* (1964).

All collections we have examined from the Queen Charlotte Islands are cited and, unless otherwise designated, are deposited in the Department of Agriculture herbarium at Ottawa. Specimens found in other herbaria are so noted, in which cases the standard herbarium abbreviations are those of Lanjouw and Stafleu (1964). For collections made by members of the Plant Research Institute names of the collectors are abbreviated as follows: CST (J. A. Calder, D. B. O. Savile, and R. L. Taylor); CTS (J. A. Calder, R. L. Taylor, and L. C. Sherk); T (R. L. Taylor); S (D. B. O. Savile); and CT (J. A. Calder and R. L. Taylor). The abbreviated collecting localities given in the citations do not always correspond exactly to the data on the plant specimens. Such

modifications represent an attempt to shorten citations and to supply missing place names for some areas surveyed. The latter case is exemplified by Takakia Lake, a previously unnamed alpine lake south of Moresby Logging Camp. Through the generous assistance of the Canadian Permanent Committee on Geographical Names and the British Columbia Geographic Board, we have been able to suggest, and to have accepted, a number of place names pertinent to collecting sites surveyed during 1957 and 1964. These new place names are now included in Figure 1. The citations of specimens are lumped into two general geographic regions, Graham Island and Moresby Island. All specimens collected from land areas north of the center of Skidegate Inlet and Skidegate Channel are considered to be from Graham Island, and all those collected from land areas to the south are considered to be from Moresby Island.

The distribution of each taxon is recorded on a map found at the end of the systematic treatment. All open symbols represent sight records made during our two summer surveys.

If a species is illustrated by a line drawing or photograph, a notation to this effect is made immediately after the reference to the place and date of publication of the species in question.

Most floras have a taxonomic description of each species. We have not included such descriptions because many of our taxa are represented by only a few specimens. In such cases a description would be only misleading because the total variation found within the species could not be accurately circumscribed. Too often the descriptions of species in floras are merely copied or reworded and their authors have not taken the necessary precaution of making a large series of measurements to ensure accuracy. We do not believe that descriptions, of which many would be based on an inadequate sample because of the rarity of the plant on the Islands, would make any taxonomic contribution. We have concentrated our study on the interspecific and intraspecific relationships of each taxon. After the citation of specimens the taxonomy is discussed, if necessary, and other pertinent information including distribution and habitat is given.

Wherever possible, we have avoided the use of color in keys because examination and comparison of the color of living and dried material cannot always be done with certainty. When color is used as a diagnostic character, for example in the key to *Pedicularis,* the Flower Color Detector (1953) has been utilized.

We have made no attempt to include common names for taxa. The omission of such names may be criticized by some, but our decision was made because the diversity of names applied to certain species, or the lack of any common name for others, would have led to inconsistent and rather meaningless entities in a flora such as this.

One of the most difficult tasks that writers of floras must constantly grapple with is the presentation of a balanced treatment of the taxa under consideration. As research proceeds on a flora it soon becomes evident that the taxonomic concepts of different authors vary greatly both at the generic and at the species levels. One of the problems that must be continually confronted is

the evaluation of these different concepts and their assessment in relation to the flora as a whole in order that a nearly uniform treatment for all taxa can be achieved. We can never be completely familiar with all the taxa under consideration, but an honest effort should be made to evaluate them in the light of the knowledge available.

We have tried to assess the relationships of the taxa that comprise the vascular flora of the Queen Charlotte Islands, combining our knowledge of plant relationships in the Cordilleran region with the many monographs, research reports and floras that are now available. Fortunately, the Queen Charlotte Islands are in an area bordered by regions to the north and south for which there are well-written floras. We have been able to re-evaluate the affinities of many of the British Columbia coastal elements contained in *Flora of Alaska and Yukon* by Hultén and *Vascular Plants of the Pacific Northwest* by Hitchcock and others, thereby clarifying at least some of the relationships of plants from these two areas.

Throughout the flora we have used the term *subspecies* for infraspecific taxa immediately subordinate to species. Our subspecies represent well-segregated groups within a species that can be distinguished on the basis of their morphological characters, usually distinct geographical ranges, and often habital or altitudinal preferences. The use of the term *variety* is restricted to distinct groupings within a subspecies, but such a rank is only occasionally used and then usually for segregates of broad-ranging circumboreal or circumpolar species, for example, *Pteridium*. In a few instances we have used the term variety immediately subordinate to species, as in *Ranunculus flammula*. In this and like cases infraspecific taxa are retained at varietal rank as we are reluctant to make nomenclatural changes for such poorly understood taxa. The term *forma* is used in only one case, that is, *Franseria*. The amount and kinds of morphological variation within any one species are often large and we believe there is little justification for the formal recognition of even striking morphological variants which lack distinct ranges, have no specific habitat preferences and are not reproductively isolated from normal plants in the population. Such distinctive forms are mentioned in the discussion.

In a few genera, such as *Amelanchier,* taxonomic decisions cannot be made. Although we have determined our collections as *A. florida* we have used the term aggregate in discussing this "species," thus following the concept adopted in *Flora of the British Isles* (Clapham *et al.,* 1962) for a number of apomictic and difficult species complexes. Plants in such groups have been given many names, and as a result nomenclatural problems have greatly increased. The study of aggregate species demands the use of the many techniques now available for taxonomic research before further decisions can be made. The use of the term *aggregate* helps check the indiscriminate application of names to such complexes and provides a temporary allocation of the plants in question. The use of the term also serves to indicate where taxonomic research should be carried out. This flora includes a few hybrids and we have used the hybrid formula, indicating the putative parents, rather than recognizing a specific hybrid name. The hybrid formula is used only in isolated instances of

hybridization. Widely distributed and morphologically distinct entities that have in all probability risen through hybridization and ones that could validly be treated with a hybrid name should, in our opinion, be considered as distinct taxa without indication of hybrid origin. An example of such a case is *Spiraea pyramidata*.

In general, we consider our taxonomic concepts to be conservative. Greater emphasis has been placed on combining or lumping taxa than on the splitting of a species into many segregates. We believe that indiscriminate splitting without due regard to natural populations only serves to conceal taxonomic relationships. Taxonomically difficult groups demand both adequate field observation and consideration of all aspects of taxonomic investigation. Given these prerequisites, taxonomy can place the organism in its relative position with respect to all plant life.

COMPOSITION OF THE FLORA

The vascular flora of the Queen Charlotte Islands comprises 69 families, 277 genera, and 593 species and subspecific taxa. Table 17 gives these groups by subdivisions, classes and subclasses.

Table 17. Composition of the flora on the Queen Charlotte Islands

Subdivision	Class	Subclass	Families	Genera	Species and Subspecific Taxa	
					Number	Percent of Total Flora
Psilopsida			—	—	—	—
Sphenopsida			1	1	7	1.2
Lycopsida			3	3	12	2.0
Pteropsida			65	273	574	96.8
	Filicinae		*3*	*14*	*24*	*4.1*
	Gymnospermae		*3*	*7*	*8*	*1.3*
	Angiospermae		*59*	*252*	*542*	*91.4*
		Monocotyledoneae	*11*	*59*	*183*	*30.9*
		Dicotyledoneae	*48*	*193*	*359*	*60.5*
Total vascular flora			69	277	593	100.00

In Table 18 the families and the number of genera, species and subspecific taxa in each are listed.

The 12 largest families contain 56 percent of the genera and 63 percent of the taxa in the flora. These families are given in Table 19.

If introduced taxa are excluded, the families Caryophyllaceae and Cruciferae would be deleted from Table 19 and the remaining ten families would contain 46 percent of the genera and 55 percent of the taxa of the indigenous flora.

In the flora there are 18 genera that have more than five taxa. The following four have ten or more: *Carex* (37), *Juncus* (17), *Ranunculus* (13) and *Potamogeton* (10).

Table 18. Families and the number of genera, species, subspecies, varieties, and hybrids in the flora of the Queen Charlotte Islands

Family	Number of genera	Number of species, subspecies, varieties and hybrids	Family	Number of genera	Number of species, subspecies, varieties and hybrids
Equisetaceae	1	7	Droseraceae	1	1
Lycopodiaceae	1	9	Crassulaceae	1	2
Selaginellaceae	1	2	Saxifragaceae	9	21
Isoetaceae	1	1	Rosaceae	15	31
Ophioglossaceae	1	3	Leguminosae	8	18
Hymenophyllaceae	1	1	Geraniaceae	1	3
Polypodiaceae	12	20	Linaceae	1	1
Taxaceae	1	1	Callitrichaceae	1	1
Pinaceae	3	4	Empetraceae	1	1
Cupressaceae	3	3	Violaceae	1	5
Sparganiaceae	1	3	Onagraceae	2	10
Zosteraceae	4	13	Haloragidaceae	1	1
Juncaginaceae	1	2	Hippuridaceae	1	2
Hydrocharitaceae	1	1	Araliaceae	1	1
Gramineae	29	68	Umbelliferae	9	11
Cyperaceae	5	51	Cornaceae	1	2
Araceae	1	1	Pyrolaceae	3	3
Juncaceae	2	21	Ericaceae	11	20
Liliaceae	7	10	Primulaceae	5	6
Iridaceae	1	1	Gentianaceae	3	4
Orchidaceae	7	12	Menyanthaceae	2	2
Salicaceae	1	5	Convolvulaceae	1	2
Myricaceae	1	1	Polemoniaceae	1	1
Betulaceae	1	2	Hydrophyllaceae	1	1
Moraceae	1	1	Boraginaceae	5	7
Urticaceae	1	1	Labiatae	5	6
Loranthaceae	1	1	Scrophulariaceae	7	20
Polygonaceae	3	13	Lentibulariaceae	2	5
Chenopodiaceae	4	4	Plantaginaceae	1	4
Nyctaginaceae	1	1	Rubiaceae	2	5
Portulacaceae	1	3	Caprifoliaceae	5	6
Caryophyllaceae	7	20	Valerianaceae	2	2
Nymphaeaceae	1	1	Campanulaceae	2	3
Ranunculaceae	9	25	Compositae	29	42
Cruciferae	20	31			

Particular attention was given introduced plants during our surveys of the lowlands. In addition, the life history of each taxon was noted. Table 20 gives the results of these findings.

The high percentage of indigenous perennials is not surprising for a flora found between approximately 52 degrees and 54 degrees north. However, the large number of annuals, of which most represent introduced taxa, indicates that even on the Charlottes there are some relatively dry environments. Almost without exception, these annuals, whether indigenous or introduced, occur only in the drier eastern coastal areas of Graham and Moresby islands. Many of these annuals reach their northern limit on the Charlottes; the next station to the south is in the dry southeastern section of Vancouver Island. Clearly, the indigenous annual taxa represent the remnant of a group that was once more widely distributed during or preceding the Hypsithermal.

The most interesting finding is the high degree of endemism. Eleven

endemic taxa are found on the Islands and they represent over two percent of the indigenous flora. Of these eleven taxa, nine are restricted to the subalpine-alpine zones. As the montane flora contains about 120 taxa, the endemics represent just over 9 percent of this group. This is an extremely high degree of endemism for such a relatively small area at so northern a latitude.

Table 19. The twelve largest vascular plant families with the number of genera and taxa in each

Family	Number of Genera	Number of Taxa
Gramineae	29	68
Cyperaceae	5	51
Compositae	29	42
Cruciferae	20	31
Rosaceae	15	31
Ranunculaceae	9	25
Juncaceae	2	21
Saxifragaceae	9	21
Polypodiaceae	12	20
Caryophyllaceae	7	20
Ericaceae	11	20
Scrophulariaceae	7	20

Table 20. Introduced and indigenous taxa and their life histories in the flora of the Queen Charlotte Islands

	Annual	Biennial	Perennial	Totals
Indigenous	18	5	453	476
Percent of indigenous	3.8	1.0	95.2	100
Percent of flora	3.1	0.8	76.4	80.3
Introduced	51	8	58	117
Percent of introduced	43.6	6.8	49.6	100
Percent of flora	8.6	1.3	9.8	19.7
Total	69	13	511	593
Percent of flora	11.6	2.2	86.2	100

KEY TO THE FAMILIES

A. PLANTS NOT PRODUCING FLOWERS OR SEEDS BUT REPRODUCING BY SPORES IN SPORANGIA

B. *Stems conspicuously articulated; leaves and branches in whorls; sporangia peltate (Subdivision* **SPHENOPSIDA***)* **Equisetaceae (p. 127)**

B. *Stems not articulated; leaves and branches not in whorls; sporangia never peltate*

C. *Spores produced in single, axillary or apparently axillary sporangia, or produced in single sporangia embedded in the basal portion of the leaves; leaves single-veined (Subdivision* **LYCOPSIDA***)*

1. Spores produced in sporangia embedded in the basal portion of leaves; leaves quill-like or subulate, fleshy, borne on a cormlike stem; aquatic ..... **Isoetaceae (p. 139)**

1. Spores produced in axillary or apparent axillary sporangia; leaves various, not fleshy, scattered on elongate stems; terrestrial
   2. Heterosporous; ligulate ..... **Selaginellaceae (p. 137)**
   2. Homosporous; eligulate ..... **Lycopodiaceae (p. 131)**

C. *Spores produced in sporangia arranged in clusters on or in continuous bands along the margins of leaves or embedded in special sporangium-bearing portions of fronds; leaves many-veined (Subdivision* **PTEROPSIDA,** *Class* **FILICINAE***)*

1. Eusporangiate; fronds with separate fertile spikes .. **Ophioglossaceae (p. 140)**

1. Leptosporangiate; fronds never with separate fertile spikes
   2. Fronds 1 cell thick between the veins; sori marginal and enveloped by a cup-shaped indusium .. **Hymenophyllaceae (p. 142)**
   2. Fronds more than 1 cell thick between the veins; sori variously positioned but never marginal and enveloped by a cup-shaped indusium ..... **Polypodiaceae (p. 144)**

A. PLANTS PRODUCING FLOWERS OR SEEDS

B. *Ovules naked, not enclosed in an ovary; trees or shrubs with needlelike or scalelike leaves; male sporophylls always in cones; perianth none (Subdivision* **PTEROPSIDA,** *Class* **GYMNOSPERMAE***)*

1. Leaves opposite or in whorls of 3; short shoots none .. **Cupressaceae (p. 164)**

1. Leaves alternate or in clusters on short lateral shoots
   2. Ovules on the surface of scales arranged in woody cones ..... **Pinaceae (p. 162)**
   2. Ovules solitary and terminal on short axillary shoots, drupelike ..... **Taxaceae (p. 161)**

B. *Ovules completely enclosed in a carpel; trees, shrubs, or herbs; leaves various; male sporophylls never in cones; perianth usually present (Subdivision* **PTEROPSIDA,** *Class* **ANGIOSPERMAE***)*

C. *Plants without true bark or cambium; fibro-vascular bundles distributed throughout stems; stems without central pith; leaves often parallel-veined; floral parts usually in twos, threes, or sixes, never in fives, often inconspicuous; cotyledon one (Subclass* **MONOCOTYLEDONEAE***)*

1. Carpels 3, united into a compound ovary; whorls of floral parts usually of same or multiples of same number
   2. Ovary superior
      3. Perianth segments petaloid, usually conspicuous and colored; leaves never grasslike or terete, except in *Allium* ..... **Liliaceae (p. 276)**

3. Perianth segments never petaloid, inconspicuous, chafflike; leaves grasslike or terete when present ..... **Juncaceae (p. 260)**

2. Ovary inferior

4. Plants aquatic ..... **Hydrocharitaceae (p. 178)**

4. Plants terrestrial

5. Perianth regular; leaves equitant; flowers blue; stamens 3 ..... **Iridaceae (p. 285)**

5. Perianth irregular; leaves never equitant; flowers never blue; stamen 1 ..... **Orchidaceae (p. 286)**

1. Carpels 1, or if more, becoming distinct and separated when mature; whorls of floral parts often of unequal number

2. Flowers in the axils of regularly imbricated scales or on a fleshy axis

3. Flowers crowded on a fleshy axis; leaves broad and fleshy, reticulately veined ..... **Araceae (p. 259)**

3. Flowers in the axils of regularly imbricated scales; leaves narrow, parallel veined

4. Bracts 2 (lemma and palea) to each flower; stigmas plumose; stems mostly hollow; cylindric or compressed; fruit a caryopsis .... **Gramineae (p. 178)**

4. Bracts 1 to each flower; stigmas never plumose; stems mostly solid, often 3-angled; fruit an achene ..... **Cyperaceae (p. 221)**

2. Flowers never in the axils of regularly imbricated scales nor on a fleshy axis

5. Flowers unisexual, in dense globose heads; fresh-water plants ..... **Sparganiaceae (p. 166)**

5. Flowers perfect, in spikes or on slender axillary peduncles (except in the two marine genera *Zostera* and *Phyllospadix* where flowers are unisexual); fresh- or brackish-water plants

6. Aquatic plants, never scaposelike, carpels free ..... **Zosteraceae (p. 169)**

6. Paludal plants, scaposelike; carpels weakly united and separating only at maturity .... **Juncaginaceae (p. 177)**

C. *Plants often with true bark and cambium; secondary vascular tissue produced between bark and pith; stems usually with a pith; leaves usually with reticulate, pinnate or palmate venation; floral parts mostly in fours or fives, sometimes in twos and threes, or multiples of these, usually conspicuous; cotyledons two (except in Ranunculus or Abronia) (Subclass* **DICOTYLEDONEAE***)*

1. **Trees, shrubs or woody climbers**

2. Flowers in catkins

3. Fruit a many-seeded capsule; seeds comose .. **Salicaceae (p. 300)**

3. Fruit a nut or winged nutlet, never comose

4. Leaves not distinctly petiolate, cuneate-oblanceolate, serrate near the apex only; shrubs usually less than 1 m high ..... **Myricaceae (p. 304)**

4. Leaves distinctly petiolate, never cuneate-oblanceolate, margins serrate; trees or shrubs more than 1 m high ..... **Betulaceae (p. 305)**

2. Flowers not in catkins

5. Corolla gamopetalous or absent

6. Corolla absent, flowers usually unisexual .. **Empetraceae (p. 427)**

6. Corolla present, flowers perfect

7. Leaves opposite, never coriaceous; anthers not opening by terminal pores ..... **Caprifoliaceae (p. 512)**

7. Leaves alternate or in whorls, if opposite, coriaceous; anthers opening by terminal pores ..... **Ericaceae (p. 453)**

5. Corolla polypetalous

8. Corolla irregular, yellow .. *(Cytisus, Ulex)* **Leguminosae (p. 415)**

8. Corolla regular, never yellow

9. Stamens usually many more than 10 .... **Rosaceae (p. 392)**

9. Stamens 4 to 10, equal to or twice the number of petals

10. Leaves conspicuously spinose on lower surface ..... **Araliaceae (p. 440)**

10. Leaves not spinose

11. Fruit a capsule ..... **Ericaceae (p. 453)**

11. Fruit a berry or drupe

12. Leaves palmately lobed, alternate; fruit a berry ..... **Saxifragaceae (p. 375)**

12. Leaves never lobed, opposite or whorled; fruit a drupe ..... **Cornaceae (p. 448)**

1. **Herbs**

13. Plants parasitic on branches of trees ..... **Loranthaceae (p. 308)**

13. Plants not parasitic on branches of trees

14. Corolla none

15. Leaves simple and entire, or reduced to scales

16. Leaves in whorls ..... **Hippuridaceae (p. 439)**

16. Leaves never in whorls

17. Plants scapose or scaposelike *(Caltha)* **Ranunculaceae (p. 336)**

17. Plants not scapose or scaposelike

18. Leaves sessile or scalelike, never stipulate

19. Calyx showy, white or pinkish-white ..... *(Glaux)* **Primulaceae (p. 474)**

19. Calyx not showy, never white or pinkish white ..... **Chenopodiaceae (p. 315)**

18. Leaves petiolate, if subsessile never scalelike or stipulate

20. Leaves glandular-puberulent; calyx showy, bright yellow ..... **Nyctaginaceae (p. 319)**

20. Leaves never glandular-puberulent; calyx never yellow

21. Leaves opposite, exstipulate .. **Callitrichaceae (p. 425)**

21. Leaves alternate; stipulate .... **Polygonaceae (p. 309)**

15. Leaves compound or if simple then serrate, lobed or cleft
    22. Leaves compound or if simple, deeply ternately cleft
        23. Leaves pinnately compound, stipulate ..... *(Sanguisorba)* **Rosaceae (p. 392)**
        23. Leaves never pinnately compound, exstipulate ..... **Ranunculaceae (p. 336)**
    22. Leaves never compound
        24. Plant a vine with palmately lobed leaves ..... **Moraceae (p. 307)**
        24. Plant never a vine, leaves coarsely toothed, pinnatifid, or palmately lobed
            25. Leaves opposite; stem tetragonal ..... **Urticaceae (p. 307)**
            25. Leaves alternate; stem cylindrical
                26. Leaves stipulate
                    27. Fruit a capsule ..... *(Heuchera)* **Saxifragaceae (p. 375)**
                    27. Fruit an achene ..... **Polygonaceae (p. 309)**
                26. Leaves exstipulate
                    28. Fruit a capsule, many seeded ..... *(Lepidium)* **Cruciferae (p. 357)**
                    28. Fruit a utricle ..... **Chenopodiaceae (p. 315)**

14. Corolla present
    29. **Corolla polypetalous**
        30. Stamens numerous, more than 10
            31. Leaves deeply cordate, entire, appearing peltate, either floating or submerged; plants aquatic ..... **Nymphaeaceae (p. 335)**
            31. Leaves not appearing peltate, if cordate not entire; plants aquatic or terrestrial
                32. Leaves stipulate ..... **Rosaceae (p. 392)**
                32. Leaves exstipulate
                    33. Flowers regular in congested terminal racemes; plants trailing and woody ..... *(Luetkea)* **Rosaceae (p. 392)**
                    33. Flowers not as in *Luetkea;* plants not trailing and woody ..... **Ranunculaceae (p. 336)**
        30. Stamens 10 or less
            34. Flowers irregular
                35. Fruit a legume ..... **Leguminosae (p. 415)**
                35. Fruit a capsule
                    36. Flowers in a raceme, reddish brown or white ..... **Saxifragaceae (p. 375)**
                    36. Flowers not in a raceme, yellow or blue ..... **Violaceae (p. 428)**
            34. Flowers regular
                37. Fruit an achene, capsule or follicle
                    38. Fruit an achene ..... *(Sibbaldia)* **Rosaceae (p. 392)**
                    38. Fruit a capsule or follicle
                        39. Fruit a capsule

40. Plants insectivorous; leaves with prominent gland-tipped hairs; bogs . . . . . **Droseraceae (p. 373)**
40. Plants never insectivorous
41. Seeds comose *(Epilobium)* **Onagraceae (p. 432)**
41. Seeds never comose
42. Sepals 2 . . . . . **Portulacaceae (p. 319)**
42. Sepals 4 or more
43. Flowers cruciform; stamens usually tetradynamous . . . . . **Cruciferae (p. 357)**
43. Flowers never cruciform; stamens never tetradynamous
44. Carpels 2 or 3 . . . . **Saxifragaceae (p. 375)**
44. Carpels usually 5
45. Staminodia present . . *(Parnassia)* **Saxifragaceae (p. 375)**
45. Staminodia absent
46. Leaves opposite **Caryophyllaceae (p. 322)**
46. Leaves alternate
47. Stamens 5; petals blue . . **Linaceae (p. 425)**
47. Stamens 6-10; petals never blue . . **Pyrolaceae (p. 451)**
39. Fruit a follicle
48. Carpels usually 5; leaves succulent, glabrous . . . . . **Crassulaceae (p. 374)**
48. Carpels usually 2 or 3; leaves if succulent usually pubescent **Saxifragaceae (p. 375)**
37. Fruit not an achene, follicle or capsule
49. Fruit a drupe . . . . . **Cornaceae (p. 448)**
49. Fruit not a drupe
50. Fruit nutlike
51. Plants aquatic; leaves finely dissected . . . . . **Haloragidaceae (p. 439)**
51. Plants terrestrial; leaves not finely dissected . . . . *(Circaea)* **Onagraceae (p. 432)**
50. Fruit a schizocarp
52. Flowers in umbels; ovary inferior . . . . . **Umbelliferae (p. 441)**
52. Flowers never in umbels; ovary superior . . . . . **Geraniaceae (p. 423)**

29. **Corolla gamopetalous**
53. Flowers aggregated into involucrate heads **Compositae (p. 521)**
53. Flowers never aggregated into involucrate heads
54. Plants with slender, trailing, woody stems

55. Leaves opposite ..... *(Linnaea)* **Caprifoliaceae (p. 512)**
55. Leaves alternate ..... *(Vaccinium)* **Ericaceae (p. 453)**
54. Plants never with slender, trailing, woody stems
56. Corolla irregular
57. Aquatic plants with bladders borne on leaves and branches ..... *(Utricularia)* **Lentibulariaceae (p. 504)**
57. Terrestrial plants never with bladders on leaves and branches
58. Fruit a many-seeded capsule; stems usually cylindric ..... **Scrophulariaceae (p. 491)**
59. Plants scapose, scapes 1-flowered ..... *(Pinguicula)* **Lentibulariaceae (p. 504)**
59. Plants never scapose, usually many-flowered ..... **Scrophulariaceae (p. 491)**
58. Fruit never a capsule, but splitting at maturity into indehiscent 1-seeded nutlets; stems 4-angled **Labiatae (p. 488)**
56. Corolla regular
60. Fruit an achene or nutlet
61. Leaves alternate ..... **Boraginaceae (p. 485)**
61. Leaves opposite or whorled
62. Leaves opposite ..... **Valerianaceae (p. 516)**
62. Leaves whorled ..... **Rubiaceae (p. 509)**
60. Fruit a capsule
63. Leaves pinnate ..... **Polemoniaceae (p. 484)**
63. Leaves never pinnate
64. Plant a herbaceous vine; leaves entire, reniform or hastate to sagittate ..... **Convolvulaceae (p. 484)**
64. Plant never a vine; leaves never hastate or sagittate, if reniform never entire
65. Ovary completely inferior **Campanulaceae (p. 518)**
65. Ovary superior or partly inferior
66. Petals 4; capsules circumscissile near the middle or indehiscent ..... **Plantaginaceae (p. 507)**
66. Petals 5; capsules valvate or circumscissile only at the apex
67. Stamens opposite the corolla lobes, equaling them in number .... **Primulaceae (p. 474)**
67. Stamens alternate with the corolla lobes, equaling them in number or fewer
68. Leaves opposite .. **Gentianaceae (p. 479)**
68. Leaves alternate

69. Corolla lobes bearded or fringed — **Menyanthaceae (p. 482)**
69. Corolla lobes not bearded or fringed — **Hydrophyllaceae (p. 485)**

DESCRIPTIVE FLORA

Equisetaceae

EQUISETUM

Stems annual, usually with regularly whorled branches; stomata scattered in one or two broad bands in the grooves of the stems; cones long-peduncled, not apiculate
- Fertile and sterile plants usually not alike, the sterile normally with regularly whorled branches; first internode of the primary branches much longer than the subtending stem-sheath; usually fruiting in spring
  - Sterile stems 1-3(-5) mm thick with about 6-12 ridges and with the sheaths less than 1 cm long; teeth of the sheaths of the branches 1-keeled ..... *E. arvense*
  - Sterile stems (4-) 6-12 mm thick with about (12-) 16-26 ridges and with the sheaths nearly always more than 1 cm long; teeth of the sheaths of the branches 2-keeled ..... *E. telmateia*
- Fertile and sterile plants alike; first internode of the primary branches shorter than the subtending stem sheath or the stem unbranched; fruiting in summer
  - Central cavity of main stem about one sixth the diameter of the stem; sheaths of stems loose with about 6-8 usually conspicuously scarious-margined teeth ..... *E. palustre*
  - Central cavity of main stem over half the diameter of the stem; sheaths of stem compact with about 10-18 inconspicuously scarious-margined teeth ..... *E. fluviatile*

Stems perennial, simple or at least without regularly whorled branches; stomata arranged in two rows in the grooves of the stems; cones short-peduncled, apiculate
- Stems about 5-9-ridged; teeth of the sheaths persistent — *E. variegatum*
- Stems about 20-26-ridged; teeth of at least the upper sheaths promptly deciduous ..... *E. hyemale*

1. Equisetum arvense L., Sp. Pl. 2: 1061. 1753.

GRAHAM ISLAND: 2½ mi S of Masset, *CST21271;* Yakan Pt., *CST21323;* Yakoun River Delta, *CST21554;* McClinton Bay, *CST21665;* near Lawnhill, *CST21736;* Lepas Bay, *CST22614;* Tow Hill, *CST22670;* 3 mi NW of Tlell, *CST23474;* about 10 mi SSE of Juskatla, *T19;* White Creek Muskeg, *CT36827;* Masset, Sept. 25, 1912, *Green* (UBC); Skidegate, May 1901, *Newcombe* (V).

MORESBY ISLAND: Skidegate Lake Bridge, *CST21010;* 2½ mi SW of Sandspit, *CST21082;* Red Mud Marsh, *CT35363;* Upper Victoria Lake, *CT35774.*

Equisetum arvense, a polymorphic and often weedy species, is widely distributed in British Columbia and common throughout the Queen Charlotte Islands from sea level to alpine summits. It is found in woods and meadows, on stream banks, lake and sea beaches, along roadsides and in other open habitats in a variety of soil types. Many of the varieties and forms that have been described are merely ecological variants. One of these, a phase with 3-angled branches, occurs in the northern part of its range. It has been described as var. *boreale* (Bong.) Ledeb. and is considered by Hultén (1962, p. 106) to possibly represent an arctic-montane race. However, such plants occur throughout the boreal forests of Canada and represent only the more depauperate, less-branched northern phase, which we feel should not be formally recognized.

2. Equisetum fluviatile L., Sp. Pl. 2: 1062. 1753.
E. limosum L., *l.c.*

GRAHAM ISLAND: Yakoun Lake, *CT36755.*

MORESBY ISLAND: Skidegate Lake, *CST21025;* about 2 and 4 mi S of Sandspit, *CST21947, CT36739.*

Equisetum fluviatile is represented by only four collections from the Islands, but probably occurs throughout the eastern lowlands along streams and the margins of ponds and lakes. At Skidegate Lake it was growing among logs along the shoreline, and south of Sandspit a few large colonies were found in shallow, water-filled ditches. It is also common along the east shore of Yakoun Lake near the mouth of Baddeck Creek.

3. Equisetum hyemale L. ssp. **affine** (Engelm.) Calder & Taylor, Can. J. Bot. 43: 1387. 1965.
E. prealtum Raf., Fl. Ludov. 13. 1817.
E. robustum A. Br. ex Engelm., Amer. Sci. 46: 88. 1844.
E. robustum var. *affine* Engelm., *l.c.; E. hyemale* var. *affine* (Engelm.) A.A. Eaton, Fern Bull. 11: 111. 1903.
E. hyemale var. *californicum* Milde, Verh. Zool.-Bot. Ges. Wien 2: 1264. 1862.

GRAHAM ISLAND: near Yakoun River 4½ mi S of Port Clements, *CTS35029.*

MORESBY ISLAND: between Copper Bay and Skidegate Lake, *CT23675.*

Hauke (1963), in a recent monograph of *Equisetum* subgenus *Hippochaete,* considered the circumboreal *E. hyemale* to comprise two elements, var. *hyemale* of Europe and western Asia and var. *affine* (Engelm.) A. A. Eaton of North America and eastern Asia. He distinguished the two varieties as follows:
Teeth persistent to caducous; ridges convex to bituberculate .....var. affine
Teeth caducous; ridges always bituberculate .....var. hyemale

As can be seen from the key, plants with caducous teeth and bituberculate ridges could be keyed out to either variety and this is the case with a number of collections we have seen from British Columbia, including the ones from the Queen Charlotte Islands which are somewhat intermediate between the two varieties. Hauke (1963, p. 70) has pointed out that such intermediate plants, which also occur in Alaska and eastern Asia, have ridges that are only slightly biangulate or weakly bituberculate and sheaths with a low length-to-width ratio. This latter feature is characteristic of the North American population. The two collections from the Queen Charlotte Islands comprise plants with stems up to 60 cm in height and about 1 cm in diameter with as many as 28 ridges, which are weakly bituberculate, or with transverse bands of siliceous tubercles. The sheaths have a low length-to-width ratio. The upper sheaths of overwintering stems lack teeth whereas those produced during the first year's growth have teeth that tend to be long persistent. Although it is difficult to place some collections from Alaska and British Columbia, we feel that Hauke's conservative treatment of the *E. hyemale* complex is justified.

Equisetum hyemale ssp. *affine* is rare along the northern British Columbia and Alaska coasts. The collections from the Queen Charlotte Islands are from open logged-over forest near Copper Creek between Sandspit and Skidegate Lake, and from open sand and silt banks of the Yakoun River along the road between Port Clements and Juskatla. The mass collection from the latter station shows a wide range of morphological variation and a few plants simulate the hybrid *E. hyemale* × *variegatum* (= × *E. trachyodon* A. Br.).

4. Equisetum hyemale × E. variegatum (= × **E. trachyodon** A. Br.)

The only collection of this hybrid from the Charlottes comprises plants with stems up to about 30 cm in height and 4 mm in width. The stems have green or weak blackish-girdled sheaths with persistent teeth. The hybrid was common but scattered along the upper limits of the sand beach at Lepas Bay.

5. Equisetum palustre L., Sp. Pl. 2: 1061. 1753.

MORESBY ISLAND: Skidegate Lake, *CT23637, CT35150, CT35270, CT36053, CT36068.*

Equisetum palustre, an extremely variable species, is not well represented in our collections from British Columbia. The five collections from the Queen Charlotte Islands are all from the gravel and muddy shorelines of Skidegate

Lake. At this station, the colonies consist of plants that have simple to many-branched stems.

6. Equisetum telmateia Ehrh., Hannover. Mag. 287. 1783.

GRAHAM ISLAND: 1½ mi SE of Port Clements. *CST21383;* 3 mi N of Port Clements, *T138;* Honna River, *CT36932.*

MORESBY ISLAND: Copper Bay, *CST20973;* near White Swan Bog, *CST21028, CT35301;* Sandspit, *CST21814.*

The North American *E. telemateia* of the Pacific coast and northern Michigan is considered by most authors to be a distinct entity, var. *braunii* Milde, differing from the Old World plant in stature, length of strobili, and the degree of scabridity of the internodes of sterile culms. The teeth of the sheaths of its fertile culms are supposedly not united in groups, but are single and distinct. We have not been able to compare the North American and Old World populations critically because we lack sufficient material of the latter. There is, however, so much variation in the North American plant that it cannot be segregated on the characters mentioned above. A series of specimens from British Columbia, Oregon and California includes plants which are only about 1.5 dm in height, have strobili that vary from 2 to 8 cm in length, and have the internodes of the sterile culms smooth or distinctly scabrous. The teeth of the fertile culms, although usually united in groups of 2 or 3, may be distinct.

Equisetum telmateia is widely distributed along the coast of British Columbia as far north as the Queen Charlotte Islands where it occurs in meadows and marshes and along the margins of streams in thickets and open woods. It is restricted to the lowlands of eastern Graham and northeastern Moresby islands.

7. Equisetum variegatum Schleich. ssp. **alaskanum** (A. A. Eaton) Hult., Fl. Alaska & Yukon 1: 59. 1941.
E. variegatum var. *alaskanum* A. A. Eaton, Harriman Alaska Exped. 5: 390. 1904.

GRAHAM ISLAND: near Skidegate, *CST21688;* Marie Lake, *T96.*

MORESBY ISLAND: Upper Victoria Lake, *CT35756;* Takakia Lake, *CT36368.*

Hauke (1963), in a recent treatment of the subgenus *Hippochaete* of *Equisetum,* recognized two varieties of *E. variegatum* in North America. The wide-ranging var. *variegatum* extends from the Atlantic to the Pacific and has sheaths with straight teeth possessing wide white margins, whereas var. *alaskanum* is restricted to the Pacific coast from Vancouver Island north to Atka Island in the Aleutians and has sheaths with curved teeth, which are entirely black or with narrow white margins. Plants from the Queen Charlotte Islands are up to 30 cm tall, the narrow stems 3 mm wide or less, and the teeth of their sheaths are incurved or appressed with narrow white margins.

This is the plant recognized by Hauke and Hultén as var. or ssp. *alaskanum* respectively. Hauke has pointed out that it completely intergrades with ssp. *variegatum* and this is evident from a large series of specimens we have seen from coastal and interior British Columbia. We are provisionally recognizing ssp. *alaskanum* on the basis of our examination of a few sheets from the Alaska panhandle and northern British Columbia coast, where it apparently attains its best development.

We don't know why *E. variegatum* is so rare on the Queen Charlottes as it is common elsewhere in the province both at the coast and in the interior. At Marie Lake a few clones were found in mud and sand along the shoreline and it was growing in wet, mossy coniferous woods at a small unnamed lake north of Skidegate. At Upper Victoria Lake two colonies were noted in gravelly drainage courses in the sphagnum bog adjacent to our camp site at the east end of the lake. A few plants were also found on a limestone talus slope well above tree line along the north side of Takakia Lake.

Lycopodiaceae

Lycopodium

Sporophylls not aggregated into a definitive terminal strobilus, but produced along stem in fertile zones alternating with sterile zones; reproductive buds often borne in the upper axils ..... *L. selago*

Sporophylls aggregated into a definitive terminal strobilus; reproductive buds absent in leaf axils

Sporophylls green, similar to leaves in shape; sterile branches creeping, never ascending ..... *L. inundatum*

Sporophylls yellowish, differing from leaves in shape; sterile branches erect or strongly ascending

Leaves in 6-10 ranks, not appressed, entire, ciliate or serrulate

Strobili borne on a prominent, sparsely leaved peduncle ..... *L. clavatum*

Strobili sessile at the ends of leafy branches

Ascending branches simple or few-forked from a superficial leafy creeping primary stem, which is usually yellow or green ..... *L. annotinum*

Ascending branches many-forked and usually slightly recurved, treelike from a subterranean almost leafless brown stem .... *L. obscurum*

Leaves in 4-5 ranks, appressed, entire

Sterile branches terete; strobili sessile or inconspicuously peduncled; leaves in 5 ranks .... *L. sabinaefolium*

Sterile branches flattened; strobili peduncled; leaves in 4 ranks ..... *L. complanatum*

8. Lycopodium annotinum L., Sp. Pl. 2: 1103. 1753.

GRAHAM ISLAND: about 4 mi NW of Tlell, *CST20953, CT35456;* about 7½ mi S of Masset, *CST21252;* about 3 mi SW of Tow Hill, *CST21338;* Empire Anchorage, *CS21514;* McClinton Bay, *CST21592;* Langara Island, *CST22523;* Newton Pt., *CST22985;* about 10 mi SSE of Juskatla, *T10;* about 8 mi SSW of Juskatla, *CT35478;* Juskatla, May 31, 1952, *Schmidt;* Masset, July 1914, *Green* (UBC).

MORESBY ISLAND: Chaatl Narrows, *CST21765;* Echo Harbour, *CST22348;* Upper Victoria Lake, *CT35775;* Kootenay Inlet, *CT36130;* Canoe Pass, July 26, 1910, *Spreadborough* (CAN).

Lycopodium annotinum is a widespread polymorphic circumpolar species. It is often segregated into a number of varieties or forms on the basis of the disposition and serration of the leaves, but, as a number of authors have pointed out, these segregates probably only represent ecological forms. There seems to be little taxonomic value in formalizing these ecophenotypes, but it is important to include the full range of variation in any description of this species.

On the Queen Charlotte Islands three ecological forms occur and some botanists may wish to recognize them as: (1) the spreading, distinctly serrate-leaved var. *annotinum;* (2) the appressed, serrate-leaved var. *alpestre* Hartm., and (3) the acute, ascending and entire-leaved var. *pungens* (La Pylaie) Desv. *Lycopodium annotinum* is widely distributed on the Islands and was found in many different habitats: hummocks of sphagnum bogs, exposed boggy mountain slopes, and moss-covered depressions in mature coniferous woods.

9. Lycopodium clavatum L., Sp. Pl. 2: 1101. 1753.

GRAHAM ISLAND: 7½ mi S of Masset, *CST21253;* 1½ mi SE of Port Clements, *CST21388;* Empire Anchorage, *CS21516A & B;* McClinton Bay, *CST21632;* between Ells and Mercer pts., *CST22874;* Newton Pt., *CST22963;* Juskatla, *T29,* May 31, 1952, *Schmidt;* 9 mi S of Juskatla, *T74;* Jalun Lake, *CT35632;* Yakoun Lake, Aug. 1895, *Newcombe* (V); Skidegate, Sept. 1897, *Newcombe* (V), Aug. 2, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: Skidegate Lake Bridge, *CST21012;* Chaatl Narrows, *CST21764;* Newcombe Peak, *CST22022;* Bigsby Inlet, *CST22178;* Echo Harbour, *CST22337;* Takakia Lake, *CST23136;* Mosquito Mtn., *CT23688;* Anna Inlet, *CTS34955;* between Cumshewa and Peel inlets, *CT35221;* Upper Victoria Lake, *CT35776;* Kootenay Inlet, *CT36164;* Sunday Inlet, *CT36597;* Canoe Pass, July 26, 1910, *Spreadborough* (CAN).

Lycopodium clavatum is a wide-ranging circumboreal species for which many segregates have been proposed (Fernald, 1950, p. 14). However, critical examination reveals that these infraspecific taxa are best treated as part of the variation found within a single taxon. A good example of the dubious value of these varieties and forms is evident when as many as four entities can be desig-

nated for a single plant. Collection number *CST21253,* for example, can be identified as: var. *clavatum,* var. *monostachyon* Grev. & Hook., var. *subremotum* Vict., and var. *laurentianum* Vict. Many of our collections could be so identified and surely so many varieties should not be recognized. The presence or absence of a soft, hairlike bristle at the tip of the leaves has been used to separate typical *clavatum* from var. *integerrimum* Spring. However, the importance of this character breaks down when a large number of specimens are examined and it is apparently related to the stage of development of the shoot, age of leaves, and habitat.

This species is the most common *Lycopodium* on the Islands. It is found in alpine and lowland habitats on both the east and west coasts. It forms dense mats in some sites and in the spring of the year it produces large masses of spores.

10. Lycopodium complanatum L., Sp. Pl. 2: 1104. 1753.

GRAHAM ISLAND: Juskatla, *T28B.*

The apparent scarcity of this species on the Queen Charlotte Islands may be partly due to the few suitable habitats available. *Lycopodium complanatum* usually occurs in dry woods or on rocky hillsides and such habitats are infrequent on the Islands. Hultén remarks in his discussion (1941, p. 68) of this species that it is more common in the interior parts of Alaska and is absent from the coast except in the northern part of southeast Alaska and on the Seward Peninsula. *Lycopodium complanatum* is widely distributed in British Columbia east of the Coast Mountains, but it is rare at the coast and there are no records from Vancouver Island.

The occurrence of this species on the Charlottes is based on a single vegetative plant collected in gravelly soil in an open coniferous woods near Juskatla on the south side of Masset Inlet.

11. Lycopodium inundatum L., Sp. Pl. 2: 1102. 1753.

GRAHAM ISLAND: between Tow Hill and Rose Spit, *CST21208,* 5 mi SE of Port Clements, *CST23466;* Jalun Lake, *CT35661,* Yakoun Lake, *CT36744.*

MORESBY ISLAND: Red Mud Marsh, *CST22065, CT35367;* Upper Victoria Lake, *CT35747.*

Lycopodium inundatum is a circumboreal species found in open mucky areas of swamps or bogs and in acid sandy soils. It is a rare species in British Columbia and on the Queen Charlotte Islands it was only found along the margins of ponds and lakes in the lowlands of eastern Graham and northeastern Moresby islands, and at Jalun and Upper Victoria lakes in the Queen Charlotte Ranges. It forms sprawling prostrate mats that are best developed in habitats where the competition is not too severe. The collections from the Charlottes belong to the typical phase.

12. Lycopodium obscurum L., Sp. Pl. 2: 1102. 1753.

GRAHAM ISLAND: Juskatla, *T28A;* White Creek Muskeg, *CTS34892.*

MORESBY ISLAND: Bigsby Inlet, *CTS34745.*

The distribution of this species along the Pacific Northwest coast parallels that of *L. complanatum.* In southeast Alaska it is found only in the lower portion of the panhandle, whereas in British Columbia it occurs sporadically throughout the province but is absent from Vancouver Island. This species is usually found in acid soils in open coniferous woods and along the margins of bogs.

On the Queen Charlotte Islands *L. obscurum* is an extremely rare plant and no large colonies were noted. It was collected on an open rocky and boggy mountain slope at the head of Bigsby Inlet, on gravelly soil in young second-growth coniferous woods near the logging camp at Juskatla, and in a forest clearing near the margin of a sphagnum bog in White Creek Muskeg east of Masset. At this latter site it was growing in association with *Vaccinium vitis-idaea* L., *Gaultheria shallon* Pursh and *Carex obnupta* Bailey.

13. Lycopodium sabinaefolium Willd. ssp. **sitchense** (Rupr.) Calder & Taylor, Can. J. Bot. 43. 1387. 1965.
L. sitchense Rupr., Beitr. Pfl. Russ. Reich. 3: 30. 1845.
L. sabinaefolium var. *sitchense* (Rupr.) Fernald, Rhodora 25: 166. 1923.

GRAHAM ISLAND: Empire Anchorage, *CS21513;* between Ells and Mercer pts., *CST22875;* Newton Pt., *CST22984;* Shields Bay, *CT23274.*

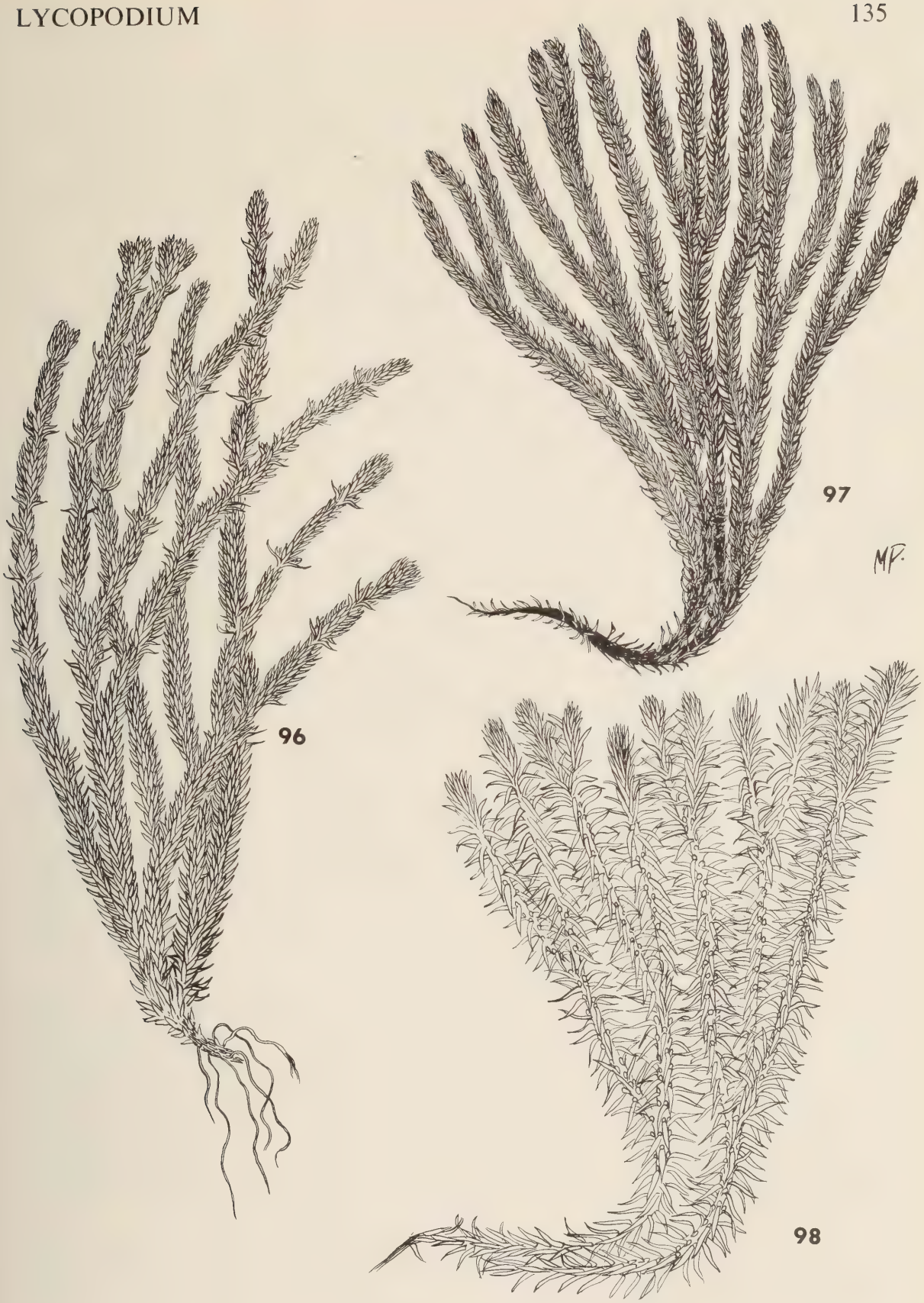
MORESBY ISLAND: Newcombe Peak, *CST22024;* Bigsby Inlet, *CST-22177, CTS34914;* Echo Harbour, *CST22336;* Takakia Lake, *CST23072;* Mosquito Mtn., *CT23727, CT36473;* Anna Inlet, *CTS34954;* Yatza Mtn., *CT35720;* Mt. Russ, *CT36139;* Sunday Inlet, *CT36581;* Canoe Pass, July 16 and 26, 1910, *Spreadborough* (V).

Lycopodium sabinaefolium is a widespread species in north temperate North America, extending from Newfoundland to British Columbia. Two subspecies, *sabinaefolium* and *sitchense,* have been segregated within this species and their differences have been discussed by Fernald (1923, pp. 166, 167). The latter entity has prominently terete branches and the leaves, which are adnate for less than half their length, tend to be 5-ranked.

On the Queen Charlotte Islands this species is restricted to the west coast and subalpine or alpine regions of the mountain ranges. It is usually associated with open habitats and commonly occurs on exposed rock bluffs or heathy knolls.

14. Lycopodium selago L., Sp. Pl. 2: 1102. 1753.

Largest leaves 8-12 mm long, over 1 mm wide, reflexed or strongly divergent ..... ssp. *patens*



Figures 96–98. 96. *Lycopodium selago* L. ssp. *selago*, sporophyte (× ½). 97. *L. selago* L. ssp. *miyoshianum* (Makino) Calder & Taylor, sporophyte (× ½). 98. *L. selago* L. ssp. *patens* (Beauv.) Calder & Taylor, sporophyte (× ½).

Largest leaves 7 mm long or less; less than 1 mm wide, ascending and often appressed
- Leaves 10-14 ranked, narrowly lanceolate, usually dark-green, ca. 6 mm long, thin and flexuous, strongly imbricated but not appressed; stomata inconspicuous ..... ssp. *miyoshianum*
- Leaves 8-10 ranked, ovate-lanceolate, usually yellowish-green, ca. 3-5 mm long, coriaceous, not strongly imbricated but often incurved and appressed; stomata prominent ..... ssp. *selago*

14a. Lycopodium selago L. ssp. **selago. Figure 96.**

L. selago var. *appressum* Desv., Mém. Soc. Linn. Paris 6: 180. 1827; *L. selago* f. *appressum* (Desv.) Gelert, Fl. Arctica 12. 1902.

GRAHAM ISLAND: between Ells and Mercer pts., *CST22873B;* White Creek Muskeg, *CTS34746.*

MORESBY ISLAND: Chaatl Narrows, *CST21755A;* Takakia Lake, *CST23102A;* Yatza Mtn., *CT35711A;* Kootenay Inlet, *CT36187.*

14b. Lycopodium selago L. ssp. **miyoshianum** (Makino) Calder & Taylor, Can. J. Bot. 43: 1388. 1965. **Figure 97.**

L. miyoshianum Makino, Bot. Mag. Tokyo 12: 36. 1898; *L. selago* var. *miyoshianum* Makino, *l.c.* 16: 199. 1902.

GRAHAM ISLAND: Mercer Lake, *CS21515;* Tan Mtn., *CST21614;* McClinton Bay, *CST21630;* Langara Island, *CST22581;* Dawson Inlet, *CST-22828;* between Ells and Mercer pts., *CST22873A;* Shields Bay, *CT23305;* Jalun Lake, *CT35628;* Yakoun Lake, *CT36779,* August 1895, *Newcombe* (V); Blackwater Creek, *T45;* Marie Lake, *T95;* Skidegate, Sept. 1897, *Newcombe* (V), July 11, 1910, *Spreadborough* (CAN, V).

MORESBY ISLAND: Chaatl Narrows, *CST21755B, CST21799;* Newcombe Peak, *CST22034;* Bigsby Inlet, *CST22119B, CTS34900;* Echo Harbour, *CST22319;* Takakia Lake, *CST23102B, CT36288;* Mt. de la Touche, *CT-23565;* Anna Inlet, *CTS34965;* Upper Victoria Lake, *CT35799;* Mt. Russ, *CT36132;* Mosquito Mtn., *CT36471A;* Sunday Inlet, *CT36605;* Mike Inlet, *CT36673;* east narrows Skidegate Channel, May 17, 1961, *Foster & Bigg* (UBC); Lockeport, Sept. 8, 1913, *Newcombe* (DAO, V); Peel Bay, July 19, 1957, *Morris;* Canoe Pass, July 26, 1910, *Spreadborough* (CAN).

14c. Lycopodium selago L. ssp. **patens** (Beauv.) Calder & Taylor, Can. J. Bot. 43: 1388. 1965. **Figure 98.**

Plananthus patens Beauv., Prodr. Aethéog. 100. 1805; *L. selago* var. *patens* (Beauv.) Desv., Mém. Soc. Linn. Paris 6: 180. 1827; *L. selago* f. *patens* (Beauv.) Clute, Fern Bull. 17: 20. 1909.

GRAHAM ISLAND: near Port Clements, *CST21547;* Dawson Inlet, *CTS35115;* Collinson Lake, *CT35513;* Jalun Lake, *CT35627;* Yakoun River, June 2, 1952, *Schmidt.*

MORESBY ISLAND: Bigsby Inlet, *CST22119A;* Mosquito Mtn., *CT-23723, CT36471;* mouth of Deena River, *CT23787;* Kootenay Inlet, *CT36225.*

The Pacific Northwest population of *L. selago* can be segregated into three infraspecific taxa. Of these three entities, only ssp. *miyoshianum* is restricted to the northern Pacific basin. It is characterized by dark-green narrow leaves, and ranges from British Columbia to Japan, Korea and China. Subspecies *selago* is circumpolar and on the basis of morphology and general habit the northern variety *appressum* should be included in this taxon. The third subspecies that occurs in the Pacific Northwest and also in eastern North America is ssp. *patens,* which is closely allied to the eastern *L. lucidulum* Michx. and the Asian *L. serratum* Thunb. These latter two species are separated from *L. selago* ssp. *patens* on the basis of serrated leaf margins and spore size. The relationship of these three taxa has never been carefully analyzed and must await further study,

Lycopodium selago is a very common species of *Lycopodium* on the Queen Charlotte Islands. Subspecies *miyoshianum* is more common than the other two subspecies and is essentially found along the flanks of the mountain spine running from the southern to the northern ends of the Islands. The large and usually reflexed-leaved ssp. *patens* is a lowland species of dense coniferous forest habitats and is often found on rich alluvial terraces beside creeks and lakes. The typical subspecies is not common on the Islands. It is essentially restricted to the outer exposed west coast, but one collection was made in White Creek Muskeg east of Masset on the northern coast of Graham Island. The three subspecies may grow together in the same general region, but there are evident habitat preferences for each of the taxa.

Selaginellaceae

Selaginella

Leaves lanceolate, not bristle-tipped, ciliate, spreading, herbaceous; spikes subterete; bogs, wet mossy slopes ..... *S. selaginoides*

Leaves subulate, bristle-tipped, ciliolate, appressed, evergreen; spikes 4-angled; dry rocky exposures ..... *S. wallacei*

15. Selaginella selaginoides (L.) Link, Fil. Hort. Bot. Berol. 158. 1841.

GRAHAM ISLAND: 7½ mi S of Masset, *CST21259;* 8 mi SE of Port Clements, *CST22088;* Langara Island, *CST22517;* near Tow Hill, *CST22713;* between Ells and Mercer pts., *CST22884;* Newton Pt., *CST22983;* Shields Bay, *CT23300;* White Creek Muskeg, *CTS34748;* Jalun Lake, *CT35669.*

MORESBY ISLAND: Chaatl Narrows, *CST21758;* Newcombe Peak, *CST22031;* Bigsby Inlet, *CST22170, CTS35026;* Echo Harbour, *CST22360;* Mt. de la Touche, *CT23539;* Mosquito Mtn. *CT23754;* Anna Inlet, *CTS-34932;* Upper Victoria Lake, *CT35763;* Kootenay Inlet, *CT36213;* Sunday Inlet, *CT36596.*

Selaginella selaginoides occurs sporadically throughout much of its North American range as suitable habitats are not always available. However, the lack of records reflects, at least in part, inadequate collecting, because *S. selaginoides* is an inconspicuous species that is easily overlooked, especially when it is in vegetative condition.

On the Queen Charlotte Islands it is common in sphagnum bogs, on wet boggy slopes and in boggy openings in coniferous woods from sea level to tree line, but it rarely forms extensive colonies and is never a conspicuous element of the vegetation.

16. Selaginella wallacei Heiron., Hedwigia 39: 297. 1900.

GRAHAM ISLAND: Queen Charlotte City, *CST20916;* near Skidegate Village, *CST21409;* Lina Island, *CST22918;* Towustasin Hill, *CT35534.*

MORESBY ISLAND: Koohoo Hill, *CST20966;* East Copper Island, *CST-22258;* Hotspring Island, *CST22274;* Limestone Island, *CST22417;* Takakia Lake, *CST23127, CT36290;* Mt. de la Touche, *CT23540;* Low Island, *CTS-35005;* Dass Pt., *CTS35020;* Mt. Moresby, *CT36387.*

As pointed out by Tryon (1955, p. 44), in general appearance and habitat, *S. wallacei* is one of the most variable species in the genus. On open rocky exposures plants are often short-stemmed with close-set leaves and form compact mats, whereas in damp, shaded coniferous woods these mats are usually loose with long-trailing stems and leaves that are set farther apart.

Selaginella wallacei is locally common on the relatively dry rock bluffs that border the north shore of Skidegate Inlet between Queen Charlotte City and Skidegate Village. It was also collected on nearby Lina Island and suitable habitats for it were noted on a number of other islands in the inlet. There is also one other record for Graham Island, the disjunct station at Towustasin Hill near Juskatla. On Moresby Island it was collected or noted on both basic and acidic rock formations on a number of the low rocky islands, headlands and cliffs along its east coast. In the Queen Charlotte Ranges it occurs on dry rocky exposures from near sea level to alpine summits. This species is at the northern limit of its range along the Pacific coast at Terrace (*Calder et al. 13077*) on the mainland and at Towustasin Hill on the Charlottes. Its distribution is probably continuous southward to Vancouver Island even though there are no records from the intervening coastal region.

Isoetaceae

Isoetes

17. Isoetes echinospora Dur. ssp. **muricata** (Dur.) Löve & Löve, Bot. Not. 114: 49. 1961.

I. braunii Durieu, Bull. Soc. Bot. Fr. 11: 101. 1864.

I. maritima Underw., Bot. Gaz. 13: 94. 1888; *I. echinospora* var. *maritima* (Underw.) A. A. Eaton, Fern Bull. 13: 52. 1905; *I. echinospora* ssp. *maritima* (Underw.) A. Löve, Amer. Fern J. 52: 121. 1962.

GRAHAM ISLAND: Collinson Lake, *CT35535;* Jalun Lake, *CT35633;* Pure Lake, *CT36101;* Yakoun Lake, *CT36790.*

MORESBY ISLAND: Mosquito Lake, *CST21027, CT23652, CT35308;* Bigsby Inlet, *CST22171A;* Skidegate Lake, *CT35275;* Upper Victoria Lake, *CT35709.*

The British Columbia and adjacent Alaska coastal population of *Isoetes* possessing spinose megaspores has been treated by various authors as comprising one or more species under such names as *I. braunii* Dur., *I. maritima* Underw., *I. echinospora* Dur. and *I. muricata* Dur. There have been several recent treatments of *Isoetes*. Hultén (1958, p. 254, Map 235) took a commendable conservative step in recognizing the North American material as part of a circumpolar complex within a single species *I. echinospora*. Subsequent investigators, Boivin (1961, p. 83-85) and Löve (1962, p. 113-123), concur with Hultén's broad treatment, but both authors have subdivided the North American population into a number of infraspecific taxa. It is unfortunate that neither author provided a key, thus making identification of their proposed segregates virtually impossible. The northwestern North American coastal population is treated as ssp. *muricata* var. *braunii* by Boivin (*loc. cit.*, p. 84) and as var. *maritima* or ssp. *maritima* by Hultén and Löve, respectively. Clearly all authors agree that this population is part of the entity *I. echinospora,* but there seems to be little agreement as to the infraspecific designation. We recognize the North American population as distinct from the typical subspecies of Europe, but do not recognize any further subdivision in North America. *Isoetes echinospora* is a distinct entity in North America easily distinguished from all other species by the conspicuous spinose wall of the megaspore. Segregates within *I. echinospora* have been proposed on the basis of leaf, habit, and spore size, but the number of leaves and their disposition as well as the habit of the plant is strongly influenced by the environment. Megaspore size within *I. echinospora* has a wide range, but in all recent studies of *Isoetes* no statistical survey has been completed to show that different megaspore diameters are related to the different entities proposed. For these reasons, we treat the variable North American entity simply as a single subspecies of the wide-ranging *I. echinospora.*

On the Queen Charlotte Islands *I. echinospora* was noted as a common element of the aquatic vegetation of a number of lakes. It usually grows on a sand or gravel substratum but is found occasionally washed up along beaches and among floating log debris.

Ophioglossaceae

Botrychium

Sterile blades once pinnate, oblong, glabrous, sessile or short-stalked ..... *B. lunaria*
Sterile blades tripinnate, deltoid, sparsely pilose, long-stalked ..... *B. multifidum*

18. Botrychium lunaria (L.) Sw. in Schrad., J. Bot. 2: 110. 1801.

Pinnae conspicuously fan-shaped, usually entire ..... *ssp. lunaria*
Pinnae obovate or spoon-shaped, incised ..... *ssp. minganense*

18a. Botrychium lunaria (L.) Sw. ssp. **lunaria**

GRAHAM ISLAND: Masset Spit, *CST22641A, CT35696A.*

18b. Botrychium lunaria (L.) Sw. ssp. **minganense** (Vict.) Calder & Taylor, Can. J. Bot. 43: 1388. 1965.
B. minganense Vict., Trans. Roy. Soc. Can. III. 21: 331. 1927; *B. lunaria* var. *minganense* (Vict.) Dole, Fl. Vermont ed. 3. 1. 1937.

GRAHAM ISLAND: Masset Spit, *CST21233, CST22641, CTS34731, CT35696.*

Although *B. lunaria* ssp. *lunaria,* ssp. *minganense* and intermediates occasionally grow together we believe both subspecies should be recognized. Subspecies *minganense* may be recognized by its yellowish-green appearance, incised, obovate or spoon-shaped pinnae, and its tendency to grow in clumps. Its pinnae are rarely all alike and the length-to-width ratio of the sterile blades is usually greater than in the typical phase. Subspecies *lunaria* is darker green and the conspicuous fan-shaped pinnae that are usually entire are sometimes slightly notched or incised. In the southern part of British Columbia ssp. *lunaria* occurs at high elevations usually in subalpine or alpine meadows, but farther north it is found in both lowland and alpine habitats. The only collections of ssp. *minganense* that we have seen from the province are from Masset Spit in the Charlottes and from the Murray Range at Pine Pass (*Calder et al. 14057*) in the Rocky Mountains. It has also been reported by Clausen (1938, p. 69) from the Cascade Mountains and the Kootenay District in southern British Columbia.

The six collections cited are all from the grassy sward along the upper part of the beach at the base of the shingle spit northwest of Masset. Although both subspecies were growing on the Islands few plants with intermediate characters were noted.

19. Botrychium multifidum (Gmel). Rupr. ssp. **silaifolium** (Presl) Clausen, Bull. Torrey Club 64: 271. 1937.

B. silaifolium Presl, Rel. Haenk. 1: 76. 1825.
B. multifidum var. *intermedium* (D. C. Eaton) Farwell, Rep. Mich. Acad. 18: 87. 1916.
B. multifidum var. *robustum* (Rupr.) Christ., Sv. Vet.-akad. Handl. V. 1: 49. *pl.* 3. 1928; *B. multifidum* ssp. *robustum* (Rupr.) Clausen, Bull. Torrey Club 64: 272. 1937.

GRAHAM ISLAND: near Skidegate, *CST21691,* July 18, 1910, *Spreadborough* (CAN); Image Pt., *CST23256;* Yakoun Lake, *CT36782.*

MORESBY ISLAND: Echo Harbour, *CST22356;* Red Mud Marsh, *CST23189;* Anna Inlet, *CTS34939;* between Cumshewa and Peel inlets, *CT35218;* Upper Victoria Lake, *CT35777.*

Clausen (1938), in a monograph of the Ophioglossaceae, recognized five subspecies of *B. multifidum* all of which occur in western North America. As in other species of *Botrychium* the races are not well defined and intermediate plants frequently occur. It is only necessary for us to consider the three northern races, sspp. *multifidum, silaifolium* (Presl) Clausen and ssp. *robustum* (Rupr.) Clausen, as the other two, sspp. *californicum* (Underw.) Clausen and *coulteri* (Underw.) Clausen, are confined to the western United States. The three subspecies which have been reported for British Columbia or Alaska were distinguished by Clausen as follows:

Plants rather large, 15-42 cm high; the blades 7-15 cm long, 3-21 cm wide; the ultimate divisions usually rather remote and not imbricate ..... ssp. *silaifolium*
Plants of medium or small size, 5-25 cm high; the blades 1-7 cm long, 1-8 cm wide; the ultimate divisions usually somewhat crowded and sometimes overlapping
The divisions of the sterile blade commonly obtuse or rounded at the tips; the plants mostly glabrous .. ssp. *multifidum*
The divisions of the sterile blade acutish; the plants sparingly hairy ..... ssp. *robustum*

In Hultén's flora of Kamchatka (1927, p. 48) Christensen recognized Ruprecht's *B. multifidum* var. *robustum,* which he stated was intermediate between the European *B. multifidum* and *B. silaifolium.* In a subsequent treatment of the pteridophytes in Hultén's (1937*a,* p. 56) *Flora of the Aleutian Islands,* Christensen points out that "the plant [Aleutian] is undoubtedly identical with that reported as *B. multifidum* var. *robustum* in my flora of Kamtchatka" and he referred it to *B. silaifolium.* Clausen (*loc. cit.,* p. 36) also recognized the Alaska plant as a distinct entity, ssp. *robustum,* but he apparently only saw a single collection made by L. M. Turner on Unalaska Island. He stated that it is "a little known subspecies, whose relationships with ssp. *typicum* and ssp. *silaifolium* are still not clear." Although the Unalaska collection Clausen cited and one we have seen from Cold Bay (Alaska Peninsula, *Schofield 2496*) have acute blades and segments, they fall well within the normal range of variation of ssp. *silaifolium* and are a good match for specimens

we have seen from Vancouver Island and the adjacent mainland. The character of pubescence stressed by Clausen is not a reliable one. Fronds of one year's growth are sparingly to moderately pubescent, but successfully overwintered fronds are usually glabrous. We also suspect that the brownish color of the hairs on herbarium specimens referred to by Clausen is the result of improper drying.

There is considerable variation in plant height, size of the sterile blades, and the shape and disposition of the blade segments in the Queen Charlotte Island material. This variation is clearly shown in a mass collection we made in 1957 in Red Mud Marsh on the road from Sandspit to Copper Bay. The plants range from 9 to 30 cm in height, the blades are 2.5 to 12 cm long and 4 to 15 cm wide, and the remote or crowded blade segments are oblong, ovate, obovate, or suborbicular. We are referring all the collections from the Queen Charlotte Islands to ssp. *silaifolium,* which we consider to be a weak segregate of *B. multifidum* and probably best developed in the coastal regions of British Columbia, Washington and eastern Asia. It intergrades freely with ssp. *multifidum,* which in North America extends from the Atlantic coast to central British Columbia. The variation between the two subspecies is probably in part ecological for ssp. *multifidum* is usually a plant of sterile, sandy and gravelly soils in thickets and along roadsides, whereas ssp. *silaifolium* is usually found in open forest, bogs and meadowland in areas of higher precipitation.

Although *B. multifidum* ssp. *silaifolium* was collected eight times on the Charlottes, it is a rare species. Six of the collections are represented by only one or two plants. It was common in Red Mud Marsh and about 25 plants were found along the grassy and gravelly shoreline of Upper Victoria Lake in 1964. There is a Newcombe record from the Islands in the Provincial Museum at Victoria, but there is no indication as to where the collection was made.

Hymenophyllaceae

Mecodium

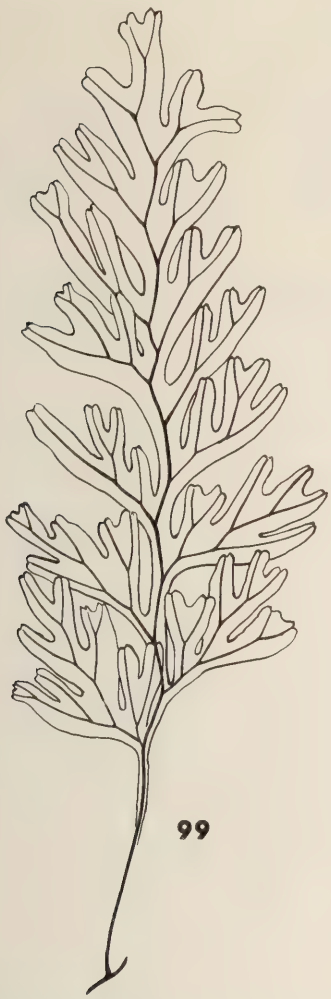
20. Mecodium wrightii (v.d. Bosch) Copeland, Philip. J. Sci. 67: 23. 1938. **Figures 99 and 100.**

Hymenophyllum wrightii v.d. Bosch, Synopsis 51. 1859.

GRAHAM ISLAND: Dawson Inlet, *Calder, Savile, Taylor & Persson 22850, CTS35107;* Aug. 29, 1961, *Schofield* (UBC); Van Inlet, July 22, 1966, *Schofield* (UBC).

MORESBY ISLAND: Chaatl Island, *Schofield & Boas 18797* (UBC).

This interesting Hymenophyllaceous fern was previously known only from northern Japan and southern Korea and represents the first known record for a filmy fern in western North America. The relationship of this fern to other members of the Hymenophyllaceae and its peculiar disjunct distribution have been discussed by Iwatsuki (1961, p. 141-144), who examined the 1957 collection from Dawson Inlet.





Figures 99-100. *Mecodium wrightii* (v.d.Bosch) Copeland. 99. Habit of frond (× 1.8). 100. Sorus (× 8).

The discovery of *Mecodium* was made by Dr. Herman Persson, who accompanied our survey party in July 1957 for the purpose of collecting the bryophyte flora. After Dr. Persson found *M. wrightii* on shaded cliff faces at the north end of Dawson Inlet we searched for this species in the surrounding areas and in all other likely habitats encountered during the remaining period of the survey. However, only this one localized population was observed. During our 1964 survey we again located *M. wrightii* at this station, but this time it was found in the dense coniferous and alder forest along the small creek at the west side of the head of the inlet. The population extended from near the shoreline about 700 yards inland and colonies were noted growing at the bases of conifers, on overturned stumps and again on shaded cliff faces. Schofield (pers. comm.) has found sporophytes along both the east and west sides near the head of the inlet. It is estimated that the sporophyte population covers about four square miles. The Dawson Inlet material produced abundant sporangia. Schofield (pers. comm.) has recently found an additional colony in nearby Van Inlet.

Schofield has found gametophytes on earth of overturned stumps at about 500 feet on nearby Chaatl Island. He has found two stations on the adjacent British Columbia mainland, at Kloiya Bay about 12 miles east of Prince Rupert (*Schofield 13945,* UBC), and Rainbow Lake about 17 miles east of Prince Rupert (*Schofield & Boas 20836,* UBC). The gametophytes bear deciduous marginal cell-masses; thus, once the gametophytes become established, they can be freely propagated asexually.

Mecodium wrightii occurs in a coniferous-deciduous forest association of *Tsuga heterophylla* (Raf.) Sarg., *Picea sitchensis* (Bong.) Carr., *Thuja plicata* D. Don, *Alnus rubra* Bong., *Alnus crispa* ssp. *sinuata* (Regel) Hult., *Menziesia ferruginea* Smith, *Vaccinium parvifolium* Smith and *V. ovalifolium* Smith. In addition, Persson and Schofield (pers. comm.) have indicated the following bryophyte associates: *Brazzania tricrenata* (Wallb.) Trev., *Cephalozia media* Lindb., *Dicranum majus* Turn., *Diplophyllum albicans* (L.) Dum., *Isopterygium elegans* (Hook.) Lindb., *Plagiothecium undulatum* (Hedw.) Br. & Sch., *Scapania bolanderi* Aust., *Takakia lepidozioides* Hatt. & Inoue and *Dicranella heteromalla* (Hedw.) Schimp.

Polypodiaceae

Fronds dimorphic, fertile fronds with contracted pinnae, longer than sterile fronds
- Fronds once pinnate, hydathodes absent ..... *Blechnum*
- Fronds bi- to tri-pinnate, hydathodes present ..... *Cryptogramma*

Fronds all alike or nearly so
- Sori marginal, covered by indusium-like flaps or inrolled margins of the fronds
  - Pinnules pubescent on lower surface; sori continuous along pinnule margin ..... *Pteridium*
  - Pinnules glabrous; sori distinct and only on one margin of pinnule ..... *Adiantum*
- Sori not marginal, naked or covered by nonmarginal indusia
  - Sori without indusia
    - Fronds pinnatifid, never pinnate ..... *Polypodium*
    - Fronds pinnate-pinnatifid
      - Fronds ternate, bipinnate-pinnatifid ..... *Gymnocarpium*
      - Fronds never ternate, once pinnate-pinnatifid ..... *Thelypteris*
  - Sori with indusia
    - Indusia linearly attached
      - Fronds once pinnate-pinnatifid, evergreen.. *Asplenium*
      - Fronds bipinnate-pinnatifid, deciduous..... *Athyrium*
    - Indusia attached at a point
      - Indusia-hoodlike, marginally attached ..... *Cystopteris*
      - Indusia orbicular or reniform, centrally or submarginally attached

Indusia centrally attached, orbicular	*Polystichum*
Indusia submarginally attached, reniform	
Fronds once pinnate-pinnatifid	*Thelypteris*
Fronds bipinnate-pinnatifid	*Dryopteris*

ADIANTUM

21. Adiantum pedatum L. ssp. **aleuticum** (Rupr.) Calder & Taylor, Can. J. Bot. 43: 1388. 1965. **Figure 101**.
A. pedatum var. *aleuticum* Rupr., Beitr. Pfl. Russ. Reich. 3: 49. 1845.

GRAHAM ISLAND: Empire Anchorage, *CS21487;* Queen Charlotte City, *CST21540;* Langara Island, *CST22542;* Dawson Inlet, *CST22830, CT35121;* Blackwater Creek, *T41, CTS35066;* Marie Lake, *T94;* Jalun Lake, *CT35609;* Long Inlet, *CT35997*.

MORESBY ISLAND: Koohoo Hill, *CST20967, CT36252;* near Alliford Bay, *CST21062;* Chaatl Narrows, *CST21738;* near Copper Bay, *CST21928;* East Copper Island, *CST22259;* Echo Harbour, *CST22328;* Takakia Lake, *CST23122;* Mt. de la Touche, *CT23549;* Limestone Island, *CTS34818;* head of Cumshewa Inlet, *CT35223;* Kootenay Inlet, *CT36226;* Kaisun, July 1897, *Newcombe* (V); Lockeport, May 22, 1923, *Newcombe* (V).

Figure 101. *Adiantum pedatum* L. ssp. *aleuticum* (Rupr.) Calder & Taylor, in an open east-facing rock runnel at about 1,000 feet, head of Long Inlet west of Queen Charlotte City, Graham Island.



Almost all the collections of *A. pedatum* we have seen from British Columbia, Alaska and elsewhere in the Pacific Northwest clearly belong to ssp. *aleuticum*. This subspecies usually has strongly ascending branches, in contrast to those of the typical phase of eastern North America in which the branches are widely divergent with the lowermost arched and strongly recurved. This single character is usually sufficient to distinguish the two subspecies. In addition the pinnae of ssp. *aleuticum* are usually fewer, the pinnules are often more deeply lobed and their tips are acute rather than rounded, and the sinuses between the pinnules are usually broader. These latter characters are helpful in determining the occasional plant of ssp. *aleuticum,* which has spreading and slightly recurved branches.

Fernald and other botanists considered the eastern North American plant of the serpentine and dolomite belts of southern Quebec, northern Vermont, Newfoundland, and isolated localities in western Ontario and northern Wisconsin to be ssp. *aleuticum*. However, this plant, with its stiffly upright crowded stipes, bluish-green glaucous fronds, consistently smaller pinnules, and conspicuous indusia, appears to be a distinct race quite unlike the wide-ranging ssp. *pedatum* of eastern North America. Similar plants are found on serpentine formations in California, for example, Gasquet, Del Norte County, *Parks & Tracy 9520*. In ssp. *aleuticum* the stipes are not tightly clumped, the fronds are never glaucous, the pinnules are usually large, and the indusia are inconspicuous. Hultén's treatment of *Adiantum* in his *Flora of Alaska and Yukon* (1941, p. 42) is misleading. All the Alaska records are cited under var. *aleuticum,* but he incorrectly states that the typical phase occurs on Attu Island, Unalaska Island, and on the southern coast of Alaska to California.

Adiantum pedatum is common and widely distributed throughout the Queen Charlotte Islands in shady situations along ledges and in crevices of cliffs and rocky outcrops from sea level to tree line. It was not found in the lowlands of northwestern Graham Island, which is covered by dense coniferous forest with intermittent sphagnum bogs and few rocky exposures.

Asplenium

Stipes and racheae purplish brown throughout ..... *A. trichomanes*
Stipes nearly always brownish or dark colored below; upper part of stipes and racheae green ..... *A. viride*

22. Asplenium trichomanes L., Sp. Pl. 2: 1080. 1753.

GRAHAM ISLAND: Towustasin Hill, *CT35529.*

MORESBY ISLAND: Koohoo Hill, *CST20959A, CT36254;* Limestone Island, *CTS34819,* May 1901, *Newcombe* (V), June 9, 1913, *Newcombe* (UBC, V); Crescent Inlet, *CTS34996;* Mt. Moresby, *CT36381;* Kaisun, *CT36530,* July 16, 1897, *Newcombe* (CAN), Aug. 1897, *Newcombe* (V).

Asplenium trichomanes is of sporadic occurrence on the Queen Charlotte Islands and along the British Columbia–Alaska coast. On the Charlottes it is

usually found on calcareous outcrops, but it is not an obligate calcicole. It is locally common along the base of the vertical limestone cliffs at Koohoo Hill, in cliff crevices of a steep, north-facing runnel at about 1,000 ft on nearby Mount Moresby, and on limestone cliffs at the shoreline near the abandoned Haida village of Kaisun on the west coast. Only a few scattered plants were noted at the other stations cited. Plants from the Charlottes usually have small fronds ranging from 3 to 10 cm in length.

23. Asplenium viride Huds., Fl. Angl. 385. 1762.

GRAHAM ISLAND: Empire Anchorage, *CS21465;* Tan Mtn., *CST-21610;* Newton Pt., *CST22993;* Long Inlet, *CT35954.*

MORESBY ISLAND: Koohoo Hill, *CST20959B;* Anna Inlet, *CTS34964;* Crescent Inlet, *CTS34995;* Mt. Russ, *CT36134;* Takakia Lake, *CT36303;* Mt. Moresby, *CT36378;* Kaisun, *CT36531,* July 12, 1897, *Newcombe* (V), July 16, 1897, *Newcombe* (CAN); Lockeport, Sept. 8, 1923, *Newcombe* (V); head of Cumshewa Inlet, Aug. 22, 1961, *Schofield* (UBC).

Asplenium viride is a pronounced calciphile found throughout the Queen Charlotte Ranges from sea level to well above tree line. It is not a common species on the Charlottes and the relatively large number of records are a result of our attempt to survey the vegetation of as many calcareous outcrops as possible. This species is locally common in niches along the base of the vertical cliffs a few hundred feet from the shoreline at Empire Anchorage, in cliff crevices of a north-facing runnel on Mount Moresby, and on both basic and acidic rock outcrops above tree line along the north shore of Takakia Lake. At most stations only a few plants were noted. *Asplenium viride,* the more common of the two species of this genus found on the Islands, occasionally grows in association with *A. trichomanes* L.

Athyrium

24. Athyrium filix-femina L. (Roth.) ssp. **cyclosorum** (Rupr.) C. Chr. in Hult., Fl. Aleut. Is. 50. 1937.
A. filix-femina var. *sitchense* Rupr. ex Moore, Ind. Fil. 183. 1860.

GRAHAM ISLAND: west of Queen Charlotte City, *CST22464;* Lepas Bay, *CST22623;* Tow Hill, *CST22664;* about 8 mi S of Masset, *CST22814;* about 6 mi N of Skidegate, *CT23687* (DAOM); Long Inlet, *CT35984;* mouth of Kliki Creek, *CT36824;* Yakoun River about 4½ mi S of Port Clements, *CT36888;* Langara Island, June 1, 1952, *Guiget* (V); Skidegate, July 1897, *Newcombe* (V), July 29, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: about 1 mi E of Skidegate Lake, *CST21001A & B;* near Alliford Bay, *CST21824;* East Copper Island, *CST22204;* head of Cumshewa Inlet, *CT35226;* Kaisun, *CT36529.*

Athyrium filix-femina is a highly variable circumboreal species which extends southwards into the tropics. Many races have been recognized, but there has been no overall treatment of the species taking into consideration the extensive variation that is exhibited throughout its range. We are following most authors in recognizing the plant of western Canada and Alaska as a distinct race, ssp. *cyclosorum* (=var. *sitchense* Rupr.), even though we are unable to distinguish some collections from European material. Subspecies *cyclosorum* is stated by Morton (*in* Gleason *et al.,* 1952*a,* p. 43) to differ from the widely distributed var. *michauxii* Mett. of central and eastern North America by its shorter stipes with larger, shorter-celled and usually paler basal scales. Its indusia are mostly horseshoe-shaped rather than asplenioid, and are long-ciliate rather than short-ciliate. The most reliable distinguishing character appears to be in the length of the stipe, which is usually about one third the length of the blade in ssp. *cyclosorum* and half as long in var. *michauxii.* In a treatment of *Athyrium* for North America, Butters (1917, p. 201) recognized the lady fern of the southwest United States as a distinct geographic variant, var. *californicum,* which he stated differs in its extremely large spores and usually puberulent rachis. We have only seen a single collection of *A. filix-femina* from this region and are unable to judge if it differs significantly from the more northern population.

Athyrium filix-femina ssp. *cyclosorum* is widely distributed throughout the lowlands of the Queen Charlotte Islands. It occurs in or along the margins of coniferous woods, in logged-over forest and occasionally on open rock bluffs by the sea. In exposed situations and in more densely shaded forest habitats plants are often sterile with more rounded and less incised pinnules (var. *sitchense* f. *hillii* (Gilbert) Butters). A few plants were found to have conspicuously lacerate pinnules, a fairly common phenomenon in many fern species.

Blechnum

25. Blechnum spicant (L.) With., Bot. Arr. Gr. Brit. ed. 3. 3: 765. 1796.
Struthiopteris spicant (L.) Weiss, Pl. Crypt. Gott. 287. 1770.

GRAHAM ISLAND: Tow Hill, *CST21187;* near Masset Spit, *CST-21246;* about 3½ and 15 mi S of Masset, *CST21270, CT35568;* Empire Anchorage, *CS21486;* Yakoun River Delta, *CST21545;* Langara Island, *CST22583,* June 1, 1952, *Guiget* (V); Juskatla, *T30;* Blackwater Creek, *CTS35068;* Skidegate, Sept. 1895, *Newcombe* (V), June 29, 1910, *Spreadborough* (CAN); Lawn Pt., May 27, 1951, *Cowan* (UBC); 5 mi NW of Tlell, June 2, 1951, *Cowan* (UBC); Yakoun Lake, Aug. 1895, *Newcombe* (V).

MORESBY ISLAND: Koohoo Hill, *CST20968, CT36256;* about 3 mi S of Copper Bay, *CST21891;* Echo Harbour, *CST22326;* Red Mud Marsh, *CST23205;* Fairfax Inlet, *CT23616;* Upper Victoria Lake, *CT35778;* Kootenay Inlet, *CT36159;* Cape Fanny, Aug. 9, 1957, *Mills;* Sandspit, *Foster & Joslin 45* (UBC).

Blechnum spicant is one of the most common and widely distributed ferns on the Queen Charlotte Islands. It is found in almost every habitat from sea level to tree line, and was noted in all areas that were thoroughly surveyed. Although it is a conspicuous element of the understory in densely shaded spruce-hemlock forest, it rarely produces fertile fronds under such conditions. Similarly, small plants with sterile fronds are often found in open bogs where there is poor drainage.

Cryptogramma

26. Cryptogramma crispa (L.) R. Br. ssp. **acrostichoides** (R. Br.) Christ., Geogr. Farne 123. 1910.

C. acrostichoides R. Br. in Richardson, Bot. App. Franklin J. 867. 1823; *C. crispa* var. *acrostichoides* (R. Br.) Clarke, Trans. Linn. Soc. II. 1: 460. 1880.

GRAHAM ISLAND: between Queen Charlotte City and Skidegate, *CST23259, CTS34790;* Towustasin Hill, *CT35528.*

MORESBY ISLAND: Newcombe Peak, *CST22009;* Takakia Lake, *CST23042, CT36302;* Mt. de la Touche, *CT23555;* Mt. Moresby, *CT35324, CT36399;* Koohoo Hill, *CT36255.*

Plants of *C. crispa* from the Queen Charlotte Islands are similar to those found in Alaska and elsewhere in British Columbia. They possess triangular to lanceolate, commonly ovate-lanceolate, sterile fronds which are bi- to tripinnate with the veins of the ultimate segments inconspicuous, but ending in prominent hydathodes, and the basal scales of the stipes are almost always dark centered. In contrast, the more than 40 European collections we have seen have more delicate, highly dissected, membranaceous sterile fronds which are usually tri- to quadri-pinnate with the veins of the ultimate segments conspicuous, but with the hydathodes neither sunken nor prominent. In the Old World plant the basal scales of the stipes are concolorous, usually pale brown. Fernald (1935*a*, p. 238-247) has discussed these differences and the relationship of the North American and eastern Asiatic ssp. *acrostichoides* to the European ssp. *crispa.* His statement that, "in its very thick and opaque fronds var. *acrostichoides* shows the results of long-continued growth in the drier region of North America," may be correct in part, but is of little significance as this subspecies has a large degree of tolerance to varying climatic conditions. Plants with thick fronds occur along the British Columbia – Alaska coast in a belt of extremely high precipitation and during the Pleistocene it must have been growing under similar conditions in at least part of its western range. In addition, there is no coastal gap in its distribution as indicated by Fernald (Map 12, *op. cit.).*

In his *Flora of Alaska and Yukon,* Hultén (1941, p. 41) recognized Ruprecht's *C. sitchensis* (based on a collection from Sitka) as a minor race, *C. crispa* ssp. *acrostichoides* var., *sitchensis.* This variety is stated to have

broadly deltoid, sterile tripinnate fronds which are finely dissected, the ultimate segments of which are obovate and toothed. Some specimens in the large series we have examined from the Pacific coast have more finely cut fronds, but they are usually tripinnatipartite rather than tripinnate, and the fronds are ovate-lanceolate rather than deltoid. The subalpine collections from Mount de la Touche and Takakia Lake include some plants of the *sitchensis* type but it is a weak segregate hardly worthy of recognition. In the Rocky Mountains of southern British Columbia the sterile fronds are usually bipinnate.

Although *C. crispa* is not a common fern on the Charlottes it probably occurs on rocky cliffs and slopes throughout the Queen Charlotte Ranges. It was one of the dominant species on talus slopes at tree line below Mount de la Touche and it was found in subalpine or alpine habitats at Takakia Lake, on Mount Moresby and on Newcombe Peak. It also occurs on cliffs bordering the south shore of Skidegate Inlet and on limestone outcrops at the base of Koohoo Hill near Moresby Logging Camp. A single plant was collected on Towustasin Hill near Juskatla.

Cystopteris

27. Cystopteris fragilis (L.) Bernh., Neues J. Bot. I. 2: 26. *pl.* 2, *fig.* 9. 1806.

GRAHAM ISLAND: Empire Anchorage, *CS21467;* Tan Mtn., *CST21611;* Shields Bay, *CT23303;* Long Inlet, *CT35981;* Jalun Lake, *CT35650A* (DAOM); Lawn Pt., May 27, 1951, *Cowan* (UBC).

MORESBY ISLAND: near Alliford Bay, *CST21823, CT36261;* Newcombe Peak, *CST22008;* Takakia Lake, *CST23143, CT36307;* Mt. de la Touche, *CT23548;* Mt. Moresby, *CT36379;* Kaisun, *CT36541,* July 16, 1897, *Newcombe* (CAN, V).

We are following Blasdell's (1962) treatment of *C. fragilis* and refer all collections from the Charlottes to ssp. *fragilis*. This species is common throughout the Queen Charlotte Ranges from sea level to well above tree line on cliffs and other rocky exposures. It is rare in the lowlands of eastern Graham and Moresby islands as there are few suitable rocky habitats in this region.

Dryopteris

28. Dryopteris austriaca (Jacq.) Woynar in Schinz & Thellung, Viert. Naturf. Ges. Zürich 60: 339. 1915.

Aspidium spinulosum var. *dilatatum* (Hoffm.) Link, Fil. Sp. 106. 1841; *Dryopteris dilatata* (Hoffm.) A. Gray, Man. ed. 1: 631. 1848.

Dryopteris spinulosa var. *americana* (Fisch.) Fernald, Rhodora 17: 48. 1916.

GRAHAM ISLAND: Tow Hill *CST21200;* Masset, *CST21288,* Aug. 1929, *Young* (V); near Skidegate Village, *CST21435;* Empire Anchorage, *CS21497;* McClinton Bay, *CST21652;* Kumdis Creek, *CST22116;* Queen Charlotte City, *CST22465;* Langara Island, *CST22578,* June 1, 1952, *Guiget*

(V); near Masset Spit, *CST22779, CST22788;* 4 mi S of Masset, *CST22809;* Dawson Inlet, *CST22843;* Shields Bay, *CT23328, CT23364*; Marie Lake, *T92;* between Lawnhill and Dead Tree Pt., *CST34668;* 2 mi E of Queen Charlotte City, *CTS34789;* Collinson Lake, *CT35521;* Tlell, June 2, 1951, *Cowan* (UBC); Dawson Harbour, June 26, 1897, *Newcombe* (CAN, V); Skidegate, July 1897 and July 1901, *Newcombe* (V), July 29, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: near Alliford Bay, *CST21826;* Sandspit, *CTS21848;* Bigsby Inlet, *CST22135, CTS34911;* East Copper Island, *CTS22205;* Mt. de la Touche, *CT23551;* Takakia Lake, *CT36332;* Sunday Inlet, *CT36609.*

Dryopteris austriaca is an extremely variable species with a number of freely intergrading varieties in both North America and Eurasia. There is considerable variation in the British Columbia – Alaska material, but almost all collections we have seen either closely approach or are indistinguishable from specimens determined as *D. austriaca* or *D. dilatata* from western North America and Europe, and *D. spinulosa* var. *americana* from the eastern part of the North American continent. This polymorphic complex is in need of a thorough revision and the collections from the Queen Charlotte Islands are being tentatively referred to *D. austriaca* ssp. *austriaca.*

In the 1957 survey of the Charlottes 19 collections comprising well over 100 plants were collected in order to analyze the amount of variation within the population on the Islands. This variation is indicated below and is based on characters that have been used in a number of manuals for separating the North American varieties of this species:

(1) Indusia: glabrous 18, slightly glandular 1.
(2) Lower surfaces of the fronds: glabrous 17, slightly glandular 2.
(3) Scales of stipes: dark-centered 13, essentially concolorous 6.
(4) Basal inferior and superior pinnules of lowermost pinnae 1-8 mm apart (average 5 mm).
(5) Basal inferior pinnule of the lowermost pinnae 1.8-3 times as long as the superior one (average about 2.2 times).
(6) Basal inferior pinnule of lowermost pinnae as long as or exceeding the adjacent pinnule in length.

A few specimens approach var. *spinulosa* (Müll.) Fiori in having the basal inferior and superior pinnules of the lowermost pinnae subopposite, but in other characters they belong to the typical phase.

Dryopteris austriaca is one of the most common ferns on the Islands and is found from sea level to tree line. It is a species of forest openings, logged-over areas, and open coniferous woods throughout the lowlands and on wooded mountain slopes of the Queen Charlotte Ranges. Like some other forest species it is often found perched well above the forest floor on tree stumps and fallen logs.

Gymnocarpium

29. Gymnocarpium dryopteris (L.) Newman, Phytologist 4: app. XXIV. 1851.
Phegopteris dryopteris (L.) Fée, Gen. Fil. 243. 1852.
Dryopteris linnaeana C. Chr., Ind. Fil. 275. 1905.
Gymnocarpium dryopteris var. *disjunctum* (Ledeb.) Ching., Contr. Biol. Lab. Sci. Soc. China, 9: 41. 1933; *Dryopteris disjuncta* (Ledeb.) Morton, Rhodora 43: 217, 1941.

GRAHAM ISLAND: Empire Anchorage, *CS21496;* McClinton Bay, *CST21653;* Dawson Inlet, *CST22844;* near Millar Creek, *CST23458;* near Juskatla, *S3543;* Blackwater Creek, *T49* (DAOM), *CTS35064;* Long Inlet, *CT35967;* Yakoun Lake, *CT36775;* Gold Creek, June 13, 1952, *Schmidt;* Skidegate, July 11, 1910, *Spreadborough* (CAN), July 1895, *Newcombe* (V); Honna River Trail, July 5, 1952, *Pillsbury* (UBC).

MORESBY ISLAND: about 1 mi E of Skidegate Lake, *CST21004;* near head of Cumshewa Inlet, *CST21043* (DAOM); Mt. de la Touche, *CT23552;* mouth of Deena River, *CT23788.*

Plants of *G. dryopteris* from coastal British Columbia and Alaska usually have bipinnate basal pinnae, the lowermost pair of pinnules set slightly apart. Similar plants occur throughout the range of the species but in Europe and eastern North America many have their basal pinnae pinnate-pinnatifid with relatively close-set basal pinnules. Although the Pacific coast population has on the average larger, more dissected fronds, there is no clear line of demarcation between the two types. A number of species that are widely distributed throughout British Columbia have coastal ecophenotypes that cannot be realistically segregated from inland populations.

This species occurs throughout the Queen Charlotte Islands. It is a conspicuous element of the lowland coniferous forest and occurs on open-wooded slopes to at least 1,000 ft in the Queen Charlotte Ranges. Under densely shaded conditions it often forms the dominant ground cover. This species has long-creeping rhizomes and extensive colonies are probably the result of vegetative reproduction.

Polypodium

Fronds coriaceous with 2-6 pairs of pinnules, the margins cartilaginous and the tips broadly rounded; sori 4-5 mm in diameter ..... *P. scouleri*

Fronds herbaceous with 10-25 pairs of pinnules, the margins not cartilaginous and the tips acute or long acuminate; sori 1-2 mm in diameter ..... *P. vulgare*

30. Polypodium scouleri Hook. & Grev., Ic. Fil. 1: *pl.* 56. 1827.

MORESBY ISLAND: Ninstints, Anthony Island, June 1901 and July 3, 1903, *Newcombe* (V), June 13, 1913, *Newcombe* (UBC).

The three Newcombe records of *P. scouleri* from the Queen Charlotte Islands are from near the abandoned Haida village of Ninstints on Anthony Island. We did not find this species on the east coast of Moresby Island in our survey by boat in 1957 that extended as far south as Skincuttle Inlet. However, in an aerial reconnaissance of the extreme southern end of the Charlottes in 1964 we noted many habitats for the species along the cliff-margined shorelines of Kunghit and Anthony Islands, and the smaller islands in the vicinity of Cape St. James.

31. Polypodium vulgare L., Sp. Pl. 2: 1085. 1753.

Main veins on adaxial frond surface glabrous; rhizome scales broadly ovate or cordate, appearing peltate, up to 4 mm long ..... ssp. *columbianum*
Main veins on adaxial frond surface pubescent; rhizome scales narrowly triangular, not appearing peltate, up to 12 mm long ..... ssp. *occidentale*

31a. Polypodium vulgare L. ssp. **occidentale** (Hook.) Hult., Fl. Alaska & Yukon 1: 44. 1941.
P. vulgare var. *occidentale* Hook., Fl. Bor.-Am. 2: 250. 1840; *P. occidentale* (Hook.) Maxon, Fern Bull. 12: 102. 1904.
P. glycyrrhiza D. C. Eaton, Amer. J. Sci. 2: 138. 1856.

GRAHAM ISLAND: 2½ mi S of Tlell, *CST20887;* Tlell, *CST20892;* Queen Charlotte City, *CST20915;* Tow Hill, *CST21177;* 3½ mi S of Masset, *CST21273;* Mercer Lake, *CS21500;* Yakoun River Delta, *CST21543;* McClinton Bay, *CST21675;* Langara Island, *CST22546A & B;* Blackwater Creek, *T36A & B;* Lawn Pt., *CT35441;* about 2 mi S of Rose Spit, *CT35908;* Yakoun Lake, *CT36776;* Skidegate, June 13, 1910, *Spreadborough* (CAN), July, 1901, *Newcombe* (V).

MORESBY ISLAND: Koohoo Hill, *CST20961B;* East Copper Island, *CST22203;* Gray Bay, *CST23432;* head of Cumshewa Inlet, *CT23647, CT36250;* Deena River, *CT23796;* Tuft Islets, *CTS34876;* Upper Victoria Lake, *CT35817;* Takakia Lake, *CT36369;* Kaisun, *CT36527, CT36528;* Horn Rock, Aug. 10, 1957, *Mills.*

31b. Polypodium vulgare L. ssp. **columbianum** (Gilbert) Hult., Kung. Svenska Vet.-akad. Handl. 8: 176. 1962.
P. hesperium Maxon, Proc. Biol. Soc. Wash. 13: 200. 1900.
P. vulgare var. *columbianum* Gilbert, List N. Amer. Pterid. 19, 38. 1901.

MORESBY ISLAND: Takakia Lake, *CT36360.*

The polymorphic *P. vulgare* is represented by three races in British Columbia: (1) ssp. *virginianum* (L.) Hult., which is known from a single collection from Mount Selwyn in the Peace River District; (2) ssp. *columbianum,* which is widely distributed in the southern part of the province and

also occurs at high or occasionally low elevations on Vancouver Island and the Queen Charlotte Islands; and (3) ssp. *occidentale,* which is restricted to the lowland coastal regions. The essentially eastern ssp. *virginianum* and the western ssp. *columbianum* have fronds that are glabrous on the adaxial surface and sori that usually have conspicuous paraphyses. These two subspecies are obviously closely related and differ substantially from ssp. *occidentale,* which has larger more acutely pointed fronds that are pubescent along the veins on the adaxial surface and lack or have inconspicuous paraphyses. Where ssp. *occidentale* and ssp. *columbianum* meet in the Skeena and Fraser river drainages intermediate forms occur. Hultén in his *Flora of Alaska and Yukon* reported two collections of ssp. *occidentale* from the upper Yukon River district but at a later date (1962, p. 176, Map 167B) he referred them to ssp. *columbianum*. We have seen one of these collections and it definitely belongs to ssp. *virginianum,* and it is likely that the other collection also belongs to this subspecies for ssp. *columbianum* is essentially restricted to southern British Columbia.

Polypodium vulgare ssp. *occidentale* is widely distributed throughout the Queen Charlotte Islands. It is a conspicuous element of the dense lowland forests where it occurs on rocky outcrops, on decaying logs and on the trunks of conifers and red alder (*Alnus rubra* Bong.). Along the east coast of the Islands it is found on rock bluffs and in cliff crevices at the shoreline and it occurs occasionally in the alpine zone in protected niches along cliffs. The only collection of ssp. *columbianum* from the Charlottes is from limestone cliffs at the west end of Takakia Lake, where it was growing with *Erigeron humilis* Grah., *Poa stenantha* Trin. and *Draba lonchocarpa* ssp. *kamtschatica* (Ledeb.) Calder & Taylor.

Polystichum

Fronds bipinnatipartite to bipinnate ..... *P. braunii*
Fronds pinnate
  Pinnae oblong-lanceolate or subdeltoid with conspicuously spreading spinulose teeth, the basal deltoid; stipes not usually evident and if evident rarely over 5 cm long ..... *P. lonchitis*
  Pinnae linear-attenuate with appressed or incurved spinulose teeth, the basal at least twice as long as broad; stipes conspicuous and usually over 5 cm long except in juvenile or depauperate specimens ..... *P. munitum*

32. Polystichum braunii (Spenner) Fée, Mém. Fam. Foug. 5: 278. 1852.

Racheae usually with one or two proliferous buds; pinnules adnate, not narrowed at base, contiguous, the basal distal ones usually conspicuously longer than the next ..... ssp. *andersonii*

Racheae without proliferous buds
- Pinnules substipitate, distinct, the base parallel to the midrib, the basal distal ones usually not conspicuously longer than the next
  - Dorsal surface of distal pair of pinnules and the racheae with a larger proportion of acicular to lanceolate scales; acicular scales often long; Eurasia ..... ssp. braunii
  - Dorsal surface of distal pair of pinnules and the racheae with a smaller proportion of acicular to lanceolate scales; acicular scales usually short; North America ..... ssp. *purshii*
- Pinnules strongly narrowed at base, semiadnate, decurrent, the base cuneate, the basal distal ones conspicuously longer than the next ..... ssp. *alaskense*

32a. Polystichum braunii (Spenner) Fée ssp. **alaskense** (Maxon) Calder & Taylor, Can. J. Bot. 43: 1388. 1965. **Figures 102 and 103.**
P. alaskense Maxon, Amer. Fern J. 8: 35. 1918; *P. braunii* var. *alaskense* (Maxon) Hult., Fl. Alaska & Yukon 1: 31. 1941.

GRAHAM ISLAND: Dawson Inlet, *CTS35125;* Long Inlet, *CT35998.*

MORESBY ISLAND: Mosquito Mtn., *CT23756;* Mt. Moresby, CT36376.

32b. Polystichum braunii (Spenner) Fée ssp. **andersonii** (Spenner) Fée (Hopkins) Calder & Taylor, Can. J. Bot. 43: 1388. 1965. **Figure 104.**
P. andersonii Hopkins, Amer. Fern J. 3: 116. 1913.

GRAHAM ISLAND: Blackwater Creek, *T39A.*

MORESBY ISLAND: Mt. Moresby, *CT35316, CT36397;* Mt. Russ, *CT36143;* Takakia Lake, *CT36358.*

32c. Polystichum braunii (Spenner) Fée ssp. **purshii** (Fernald) Calder & Taylor, Can. J. Bot. 43: 1388. 1965. **Figure 105.**
P. braunii var. *purshii* Fernald, Rhodora 30: 29. 1928.

GRAHAM ISLAND: Tan Mtn., *CST21595;* Shields Bay, *CT23335;* Blackwater Creek, *T39B;* near junction of Yakoun River and Ghost Creek, *CT35500.*

MORESBY ISLAND: Takakia Lake, *CST23061;* Mt. Moresby, *CT35315, CT36503;* Mt. Russ, *CT36145.*

Polystichum is a highly polymorphic genus showing extensive variation in the *P. braunii* complex. Before 1913 only *P. braunii* ssp. *braunii* was considered to occur along the British Columbia – Alaska coast, but in this year Hopkins



Figure 102. *Polystichum braunii* (Spenner) Fée ssp. *alaskense* (Maxon) Calder & Taylor, in an open east-facing rock runnel at about 1,000 feet near the head of Long Inlet west of Queen Charlotte City, Graham Island. *Thelypteris phegopteris* (L.) Slosson is in foreground.

described a new species, *P. andersonii,* from Strathcona Provincial Park, Vancouver Island. He thought it was most closely related to *P. lemmonii* Underw., but in 1918 its affinity to *P. braunii* was clearly shown by Maxon who in turn described a further segregate, *P. alaskense,* from the Alaska panhandle. The plant of eastern North America, which had long been considered as identical with *P. braunii* of Europe, was recognized as a distinct taxon by Fernald in 1928 when he described var. *purshii.* Hultén in 1941 in his treatment of the flora of Alaska and Yukon reduced *P. alaskense* to subspecific rank under *P. braunii,* and Taylor (1956, p. 116) has recently suggested that *P. andersonii* might be considered as a minor variant of this species.

Although we recognize Fernald's var. *purshii,* we consider it a weak segregate when compared with the other two North American taxa. It cannot readily be distinguished from European *P. braunii* on the basis of a number of characters which he stressed, such as texture of fronds, venation of pinnules, type of scales at the base of the stipe, and length of the bristle tips of the pinnules. It can, however, nearly always be separated by the relative abundance of the two types of scales that occur on the dorsal surface of the racheae and pinnules (*see* key). In referring to the distribution of var. *purshii,* Fernald included some plants from northern China and Sakhalin Island, but excluded Alaska collections as they were apparently too fragmentary for accurate identification. In *Gray's Manual of Botany, Eighth Edition,* (1950) he recorded only typical *P. braunii* from Alaska, but the many collections of this complex that we have seen from the Pacific Northwest do not include the typical phase.



103



104



105

Figures 103–105. 103. *Polystichum braunii* (Spenner) Fée ssp. *alaskense* (Maxon) Calder & Taylor, pinna (× 4/5). 104. *Polystichum braunii* (Spenner) Fée ssp. *andersonii* (Hopkins) Calder & Taylor, pinna (× 4/5). 105 *Polystichum braunii* (Spenner) Fée ssp. *purshii* (Fernald) Calder & Taylor, pinna (× 4/5).

In the Pacific Northwest, sspp. *alaskense, andersonii* and *purshii* are essentially elements of the coastal coniferous belt and occur in dense woods and on shaded rocky slopes where they occasionally reach tree line in sheltered situations. There is considerable variation within each subspecies and the distinguishing morphological characters are not always clearly defined. Their ranges are not distant and at times they are found growing together in the same habitat. They are obviously closely related, but we believe they fully merit subspecific rank. They comprise a series with *P. braunii* ssp. *purshii* as one extreme with bipinnate blades, no proliferous buds on the racheae, and the basal distal pinnules not conspicuously longer than the next; and *P. braunii* ssp. *andersonii* as the other extreme with bipinnatipartite blades, proliferous buds on the racheae and the basal distal pinnules conspicuously longer than the adjacent ones. It is not practical in this paper to deal with the other closely related taxa in this complex that occur in Washington and southwards. Maxon (1918, p. 34) in his key to the *P. braunii* group included *P. jenningsii,* which had been described by Hopkins (1917) from a collection made in Mount Rainier National Park, Washington. Although this species has been placed in synonymy under *P. andersonii* by some authors, it may represent a distinct race endemic to the Cascades.

Polystichum braunii occurs sporadically along the mainland British Columbia–Alaska coast and is known from a few stations in Strathcona Provincial Park, Vancouver Island. There are also disjunct stations in the Selkirk Mountains and Kootenay District in the interior of the province. On the Charlottes it is restricted to the Queen Charlotte Ranges and moist open-forest habitats along their eastern flanks. The three subspecies are rare on the Islands, but they all occur in the alpine or subalpine zones and also at low elevations. In addition to the records cited, *P. braunii* was noted by Dr. A. Sutherland Brown (pers. comm.), "about one mile south of Peel Inlet, east of the head of Packet Inlet, and south of Moresby Logging Camp." We have a collection of ssp. *purshii* from a plant growing in Sutherland Brown's garden in Victoria which is a transplant from the Moresby Logging Camp site.

33. Polystichum lonchitis (L.) Roth ex Roem., Arch. Bot. 2: 106. 1799.

GRAHAM ISLAND: Tan Mtn., *CST21615.*

MORESBY ISLAND: Newcombe Peak, *CST22041;* Takakia Lake, *CST23115, CT36333;* Mt. Moresby, *CT36400.*

Polystichum lonchitis, a rare species on the Islands, is restricted to the Queen Charlotte Ranges. The collections are from rock crevices at the base of cliffs and protected niches among boulders on talus slopes in the subalpine zone. Occasionally it extends to lower elevations in shaded rocky runnels. It is common in similar habitats especially in the Rocky Mountains but is of sporadic occurrence in the mountains of the coastal belt. The coastal gap in its Alaska distribution is not as large as the area indicated by Hultén (1941, map 17, p.

113). It was collected twice in the Kenai Peninsula in 1951 (Moose Pass, *Calder 5133;* Rocky Creek, Kenai Lake, *Calder 5189*) and there is no reason why it should not occur in the mountains both to the east and west. Although not an obligate calciphile, *P. lonchitis* apparently prefers calcareous outcrops.

34. Polystichum munitum (Kaulf.) Presl, Tent. Pterid. 83. 1836. **Figure 67.**

GRAHAM ISLAND: 3 mi SW of Tow Hill, *CST21328;* Jungle Beach, *CST21397* (DAOM); between Queen Charlotte City and Skidegate Village, *CST21405, CST23262, CTS34788;* Empire Anchorage, *CS21509;* McClinton Bay, *CST21671;* Langara Island, *CST22548;* Honna River, *CT35404;* Long Inlet, *CT36001A;* Tlell, June 2, 1951, *Cowan* (UBC); Skidegate, July 1897, *Newcombe* (V).

MORESBY ISLAND: Koohoo Hill, *CST20965,* head of Cumshewa Inlet, *CST21978, CT35231;* Sandspit, *CST21819;* near Alliford Bay, *CST21833, CST21834;* East Copper Island, *CST22206;* Hotspring Island, *CST22286;* Takakia Lake, *CST23105;* Mt. de la Touche, *CT23550;* Crescent Inlet, *CTS35000;* Kootenay Inlet, *CT36214;* Mt. Moresby, *CT36504;* Cape Fanny, Aug. 9, 1957, *Mills.*

Polystichum munitum is an extremely variable species as to the serration of the pinnae, frond shape, and size of plant. Forma *inciso-serratum* (D.C. Eaton) Clute with deeply serrate to incised pinnae and f. *imbricans* (D.C. Eaton) Clute with linear blades and crowded, obliquely overlapping pinnae are known from Vancouver Island and the adjacent mainland. The latter is an ecological phase found in open dry rocky habitats and was not noted on the Charlottes. One collection from the Islands has conspicuously serrate leaves and might be referred to f. *inciso-serratum,* but there is so much variation in leaf serration we do not believe such a taxon should be recognized.

This species is the most common fern on the Queen Charlotte Islands. Although essentially a species of bluffs and slopes in lowland coniferous forests, it frequently occurs on open, rocky exposures and cliffs at the shoreline. Plants from the latter habitats as well as occasional specimens found in rock runnels and on talus slopes near tree line are usually dwarfed. In subalpine areas these small plants sometimes superficially resemble *P. lonchitis* (L.) Roth. *Polystichum munitum* is often the dominant species of open hemlock-spruce forest at the coast, where it forms extensive colonies and attains its maximum development.

Pteridium

35. Pteridium aquilinum (L.) Kuhn ssp. **aquilinum** var. **pubescens** Underw., Our Nat. Ferns ed. 6. 91. 1900.

Pteris aquilina var. *lanuginosa* Bong., Mém. Acad. St. Pétersb. VI. 22: 176. 1832; *Pteridium aquilinum* ssp. *lanuginosum* (Bong.) Hult., Fl. Alaska & Yukon 1: 43. 1941.

GRAHAM ISLAND: Queen Charlotte City, *CST22479;* Tlell, *CT35932;* Skidegate Village, *CT36960;* Skidegate, July 1897, *Newcombe* (V).

MORESBY ISLAND: Sandspit, *CST21095,* Bigsby Inlet, *CST22138;* mouth of Deena River, *CT23779;* Anna Inlet, *CTS34966;* Sunday Inlet, *CT36591.*

All collections of this species from British Columbia and Alaska belong to the essentially western North American var. *pubescens,* which has the indusium ciliate and pubescent on the outer surface and at least the ultimate segments of the fronds sparsely to densely pubescent beneath. In contrast, the indusium of the eastern var. *latiusculum* (Desv.) Underw. is glabrous and the ultimate segments of the fronds are glabrous beneath or occasionally slightly pubescent. Both varieties belong to ssp. *aquilinum* (Tryon, 1941).

Pteridium aquilinum usually occurs in open, dry coniferous woods and on sterile sandy soils in clearings along the east coast of Moresby and Graham islands. It is particularly common in and around settlements with plants reaching a height of 3 m with fronds up to 2 m wide. This species was collected twice in open rocky and boggy subalpine habitats, but at both localities only a few small plants up to about 6 dm high were observed.

Thelypteris

Rhizomes stout, short; fronds essentially lanceolate, usually over 45 cm in length; indusia present ..... *T. oreopteris*

Rhizomes slender, long-creeping; fronds essentially triangular, usually less than 20 cm in length, indusia absent ..... *T. phegopteris*

36. Thelypteris oreopteris (Ehrh.) Slosson in Rydb., Fl. Rocky Mts. 1043, 1069. 1917.

Aspidium oreopteris (Ehrh.) Sw. in Schrad., J. Bot. 2: 35. 1801; *Dryopteris oreopteris* (Ehrh.) Maxon, Proc. U.S. Nat. Mus. 23: 638. 1901.

GRAHAM ISLAND: Shields Bay, *CT23330.*

MORESBY ISLAND: Takakia Lake, *CST23043;* Mt. de la Touche, *CT23553;* Anna Inlet, *CTS35027;* Mt. Russ, *CT36129;* Mt. Moresby, *CT36435, CT37020;* Sunday Inlet, *CT36600.*

Thelypteris oreopteris, a rare species in British Columbia, is reported by T. M. C. Taylor (1956, p. 129) from the Skeena River valley and Alice Arm along the northern coast, and by Henry (1915, p. 6) from Shawinigan, Port Simpson and Glacier. We have not seen any collections supporting Henry's records and it is doubtful if this species occurs in the interior of the province at Glacier. In 1961 it was collected by Calder and MacKay in the Elk River valley and along the Kennedy River on Vancouver Island.

This species is found in open runnels and on talus slopes from almost sea level to tree line in the Queen Charlotte Ranges. It was noted on eight occasions between the head of Shields Bay and Sunday Inlet.

37. Thelypteris phegopteris (L.) Slosson in Rydb., Fl. Rocky Mts. 1043, 1069. 1917. **Figure 102.**

Phegopteris polypodioides Fée, Gen. Fil. 243. 1852.

Phegopteris phegopteris (L.) Keys., Polyp. Cyath. Herb. Bung. 50. 1873; *Dryopteris phegopteris* (L.) C. Chr., Ind. Fil. 284. 1905.

GRAHAM ISLAND: Empire Anchorage, *CS21495;* McClinton Bay, *CST21651;* Dawson Inlet, *CST22856;* Shields Bay, *CT23313;* Blackwater Creek, *T38;* Jalun Lake, *CT35612;* Long Inlet, *CT35988;* Masset, Aug. 1929, *Young* (V).

MORESBY ISLAND: Chaatl Narrows, *CST21739;* Newcombe Peak, *CST22010;* Bigsby Inlet, *CST22158, CTS34910;* Echo Harbour, *CST22357;* Takakia Lake, *CST23142;* Mt. de la Touche, *CT23554;* head of Cumshewa Inlet, *CT35227;* Mt. Moresby, *CT36372;* Sunday Inlet, *CT36602.*

Thelypteris phegopteris occurs throughout the Queen Charlotte Ranges. It is a species of partially shaded rocky exposures and is found on cliffs or along the margins of runnels on mountain slopes from sea level to tree line. Although it cannot withstand severe competition or densely shaded conditions it is occasionally found in the lowland coniferous forest perched on upturned stumps and windfalls where some light has been able to penetrate the forest canopy. *Thelypteris phegopteris* is widely distributed on the Charlottes and was noted in all areas thoroughly surveyed except northeastern Graham Island, where there are few suitable habitats. In subalpine areas the fronds are sometimes abnormally small; for example, the collection from Takakia Lake has fronds averaging less than 10 cm in length. A Green collection in the herbarium of the University of British Columbia labeled, "July, 1914, Masset," is almost certainly in error as to locality. The locality of nearly all of Green's collections must be viewed with suspicion.

Taxaceae

Taxus

38. Taxus brevifolia Nutt., N. Amer. Sylva 3: 86. 1849.

GRAHAM ISLAND: Marie Lake, *T93;* Naden Harbour, *CT36853.*

MORESBY ISLAND: head of Cumshewa Inlet, *CST22059;* Bigsby Inlet, *CST22179, CTS34881;* Richardson Island, *CTS34917;* between Cumshewa and Peel inlets, *CT35214;* Upper Victoria Lake, *CT35779;* Kootenay Inlet, *CT36223;* Rose Inlet, *CT36987;* Tasu, June 3, 1901, *Newcombe* (V).

Taxus brevifolia, a Cordilleran species of western North America, ranges from California to the southern tip of the Alaska panhandle. On the Queen Charlotte Islands it is generally distributed but never forms large stands nor is it a conspicuous element of the vegetation. It is usually a tree about 6 to 15 m high and according to Vern Roberts, superintendent of Moresby Logging Camp, occasional specimens may have a DBH of 6 dm. Regeneration appears to be poor as few seedlings or small shrubs were noted during our extensive summer surveys. This species was previously reported from the Islands by Sudworth (1908, p. 196).

Pinaceae

Leaves in fascicles of 2	*Pinus*
Leaves not in fascicles, borne singly	
Leaves 4-angled, pungently tipped	*Picea*
Leaves flat, not pungently tipped	*Tsuga*

PICEA

39. Picea sitchensis (Bong.) Carr., Traité Gén. Conif. 260. 1855.

GRAHAM ISLAND: Delkatla Inlet, *CST20858;* 10½ mi S of Tlell, *CST20885* (DAOM); Rose Spit, *CST21219;* Torrens Island, *CST22444* (DAOM); Millar Creek, *CST23457* (DAOM); Juskatla, *S3526* (DAOM); Tlell, *CTS34646;* Dawson Inlet, *CTS35130.*

MORESBY ISLAND: near Alliford Bay, *CST21064;* head of Cumshewa Inlet, *CST21944* (DAOM); Hotspring Island, *CST22296;* Tuft Islets, *CTS34877;* Anna Inlet, *CTS34927.*

Sitka spruce, *P. sitchensis,* is restricted in its distribution to the Pacific coast from Alaska to northern California. This species probably reaches its best development on the Queen Charlotte Islands and this may be attributed to the favorable environment and to lack of competition. *Picea sitchensis* is not a major component of the coniferous forests on the Islands and rarely forms pure stands, but it is usually found with the two dominant forest species, *Tsuga heterophylla* (Raf.) Sarg. and *Thuja plicata* D. Don, with which it competes successfully because it has a rapid rate of growth. Sitka spruce is apparently the only forest species that is well adapted to the maritime sandy habitats of the east coast of the Charlottes. It is the dominant tree on dry stabilized sand dunes and flats in a narrow belt along the east and north coasts of Graham Island, and in similar habitats on Kunghit Island at the southern tip of Moresby Island. Inland this species tends to have its best development on the rich and silty bottom land adjacent to creeks and rivers. A few trees with a DBH of well over 3 m were noted south of Juskatla on stabilized silt benches beside Blackwater Creek. It is never found in the extensive bogs that are so common throughout much of Graham Island. The relationship of Sitka spruce to the other forest species and its commercial value are discussed in the Introduction.

Pinus

40. Pinus contorta Dougl. ex Loud., Arbor. Fruticet. Brit. 4: 2292. 1838.
P. contorta var. *latifolia* Engelm., Bot. King's Expl. 77. 1871.

GRAHAM ISLAND: 3½ mi NW of Tlell, *CST20950, CTS34607;* SW of Tow Hill, *CST21176;* Empire Anchorage, *CS21517;* Torrens Island, *CST22446;* Langara Island, *CST22508;* between Ells and Mercer pts., *CST22891A;* Shields Bay, *CT23386.*

MORESBY ISLAND: Bigsby Inlet, *CST22181;* White Swan Bog, *CT35371;* Upper Victoria Lake, *CT35780;* Mike Inlet, *CT36671;* Rose Inlet, *CT37002.*

Pinus contorta in western Canada is considered by some authors to consist of two races: shore pine (var. *contorta*), which is restricted to open bluffs and bogs in a narrow belt along the Pacific coast of western North America, and lodgepole pine (var. *latifolia*), which is widely distributed in the Cordilleran region east of the Coast Mountains. In Canada var. *latifolia* extends to central Alberta, where it meets the eastern jack pine (*P. banksiana* Lamb.) and in this region there is a broad zone of introgression. The segregation of the coastal var. *contorta* is essentially based on its dwarf, scrublike appearance and its inability to form large stands. In a recent paper by Roche (1963) it is clearly shown that results of experimental studies repudiate any taxonomic segregation of the inland and coastal forms of this species on the basis of stature. The habit of the coastal shore pine is directly correlated with the habitat in which it grows and its inherent lack of tolerance to shade conditions. Inland populations do not have to contend with the dense shaded habitats that characterize the coniferous forests of the coast and *P. contorta* in the interior regions often becomes a large tree forming extensive pure stands. The available habitats for this species along the coast are coastal rocky bluffs and exposed sphagnum bogs. Such habitats are not conducive to good growth and as a result trees are scrublike in appearance. We concur with Roche that both populations should have the same taxonomic designation.

On the Queen Charlotte Islands, scattered stands or isolated dwarf trees of *P. contorta,* 1 to 2 m high, characterize the extensive sphagnum bogs of eastern Graham Island. Along the coast in favorable habitats it may reach a height of 6 m.

Tsuga

Leaves with stomata on lower surface only; megasporangiate cones usually less than 2.5 cm long with 4-5 ranks of overlapping, staggered scales ..... *T. heterophylla*

Leaves with stomata on both surfaces; megasporangiate cones more than 2.5 cm long with 8-10 ranks of overlapping, staggered scales ..... *T. mertensiana*

41. Tsuga heterophylla (Raf.) Sarg., Sylva N. Amer. 12: 73. 1898.

GRAHAM ISLAND: Masset, *CST20860, CST22759* (DAOM); Tlell, *CST20949* (DAOM); near mouth of Sangan River, *CST21154;* about 8 mi SW of Port Clements, *CST21351;* Empire Anchorage, *CS21445;* Queen Charlotte City, *CST22429* (DAOM); Langara Island, *CST22506;* 9 mi N of Port Clements, *CTS34711;* Dawson Inlet, *CTS35129;* about 8 mi SSW of Juskatla, *CT35483.*

MORESBY ISLAND: 2 mi NE of Alliford Bay, *CST21838;* Copper Bay, *CST21908;* Echo Harbour, *CST22334* (DAOM); mouth of Deena River, *CT23786;* Dass Pt., *CTS35023;* between Cumshewa and Peel inlets, *CT35212.*

The western hemlock, *T. heterophylla,* occurs throughout the Queen Charlotte Islands and is the dominant tree at low elevations, where it often forms pure dense stands. Its ability to prosper, as suggested by Sudworth (1908, p. 93), is explained by its high degree of shade tolerance and its ability to establish seedlings under the dense canopy of the mature forest. After the timber has been removed, the *Tsuga* seedlings that had been previously established develop rapidly into more or less uniform pure stands. On drier sites these stands are often invaded by Sitka spruce and on low wet ground western red cedar may be an important component of the hemlock forest. The relationship of *T. heterophylla* to other forest trees on the Charlottes and its utilization as a forest product are discussed in the Introduction.

42. Tsuga mertensiana (Bong.) Sarg., Sylva N. Amer. 12: 77. 1898.

GRAHAM ISLAND: Tan Mtn., *CST21593;* Shields Bay, *CT23382;* Dawson Inlet, *CTS35108.*

MORESBY ISLAND: Anna Inlet, *CTS34943;* Yatza Mtn., *CT35706.*

Mountain hemlock, *T. mertensiana,* occurs only in the subalpine or alpine regions of the Queen Charlotte Islands. It is quite widely distributed, but never forms large conspicuous stands. Trees growing near tree line are often stunted or prostrate and rarely produce strobili. At lower elevations this species may reach a height of 7 m. The northern limit of *T. mertensiana* is in the Prince William Sound area of coastal Alaska.

Cupressaceae

Leaves pungently tipped; plants usually dioecious	*Juniperus*
Leaves not pungently tipped; plants monoecious	
Megasporangiate cones globose; scales peltate, not imbricated	*Chamaecyparis*
Megasporangiate cones ellipsoid; scales oblong, imbricated	*Thuja*

Chamaecyparis

43. Chamaecyparis nootkatensis (Lamb.) Spach, Hist., Vég. 11: 333. 1842.

GRAHAM ISLAND: Empire Anchorage, *CS21529;* Langara Island, *CST22507;* between Ells and Mercer pts., *CST22890;* Marie Lake. *T97;* Dawson Inlet, *CTS35106;* 8 mi SSW of Juskatla, *CT35482;* west end of Skidegate Channel, Sept. 1895, *Newcombe* (V).

MORESBY ISLAND: Chaatl Narrows, *CST21763;* Bigsby Inlet, *CST22180;* Takakia Lake, *CST23129;* Anna Inlet, *CTS34946;* Upper Victoria Lake, *CT35730, CT35781;* Sunday Inlet, *CT36594;* Rose Inlet, *CT36985.*

Chamaecyparis nootkatensis is a western North American coastal species extending from Oregon as far north as Prince William Sound in the Gulf of Alaska. There are isolated stations east of the Coast and Cascades mountains in the southern part of its range. It is of common occurrence throughout the wet coastal and mountain forests of the Islands, but it never forms dense stands nor is it a conspicuous element of the vegetation. It is scattered or rare in the boggy lowlands of northeastern Graham Island. Trees up to 20 m high and with a DBH of 30 cm were noted in the coniferous woods south of Juskatla, whereas trees on open boggy slopes of the west coast mountains only occasionally reach a height of 3 to 6 dm and are sometimes prostrate.

Juniperus

44. Juniperus communis L., Sp. Pl. 2: 1040. 1753.

GRAHAM ISLAND: 3½ mi NW of Tlell, *CST20936, CTS34606;* SW of Tow Hill, *CST21172;* 7½ mi S of Masset, *CST21263;* near Skidegate Village, *CST21274;* Langara Island, *CST22529,* May 21, 1952, *Beebe* (V); Lepas Bay, *CST22609;* Tlell, *CST23158,* May 27, 1951, *Cowan* (UBC); 12 mi N of Port Clements, *CTS34716;* Masset, Aug. 1902, *Newcombe* (V).

MORESBY ISLAND: Upper Victoria Lake, *CT35761.*

Juniperus communis is a variable species that has not been critically examined to determine the degree and complexity of race formation. Clapham *et al.* (1962, p. 54) indicate that the species may be divisible into several ecological and geographical subspecies. In the British Isles two extremes are recognized as separate entities and it is understood that many intermediate forms occur. Gleason (1952*d,* p. 68) recognizes three varieties in the northeastern United States and adjacent Canada, but qualifies the segregation by stating that these varieties are based primarily on differences in habit. All collections from the Queen Charlotte Islands are either completely or partially prostrate and have short, usually incurved, imbricate needles. Having such traits they might be referred to var. *saxatilis* (=var. *montana* Ait.), but this is a weak race exhibiting characters that are partly a response to the environment. *Juniperus*

communis occurs in exposed situations in bogs and on open sea bluffs along both the east and west coasts of North America, and occurs sporadically in the alpine and subalpine zones throughout the mountainous regions of British Columbia.

On the Queen Charlotte Islands coastal bluff specimens are more open and shrubby whereas those from the interior bogs are stunted, more compact and compressed branched. Most of the plants observed were dioecious and female shrubs were more abundant than male. *Juniperus communis* is generally distributed throughout the lowland sphagnum bogs of eastern and northern Graham Island and is common in the semiopen boggy interior of Langara Island. This species is apparently rare in the Queen Charlotte Ranges for it was noted at only two stations, Kootenay Inlet and Upper Victoria Lake. At both localities it occurs at low elevations on open rocky and boggy slopes.

Thuja

45. Thuja plicata D. Don, Hort. Cantab. ed. 6. 249. 1811.

GRAHAM ISLAND: near mouth of Sangan River, *CST21155;* about 8 mi SW of Port Clements, *CST21350;* Yakoun River Delta, *CST21565;* near Skidegate Village, *CST21709;* Marie Lake, *T98;* 9 mi N of Port Clements, *CTS34710;* Yakoun Lake, Aug. 1895, *Newcombe* (V).

MORESBY ISLAND: Mosquito Lake, *CST21020;* between Cumshewa and Peel inlets, *CT35188;* Tasu Harbour, June 1901, *Newcombe* (V).

The western red cedar, *T. plicata,* is a common but never dominant member of the coniferous forests on the Charlottes. It occurs infrequently in and around the margins of sphagnum bogs especially near drainage channels, and under such conditions it is usually a small, poorly developed tree growing to a height of about 7 m. In the more favorable habitats of the hemlock – Sitka spruce forest it may reach a height of 30 m, but we did not observe any trees on the Queen Charlotte Islands as large as those found in the extensive coniferous woods of Vancouver Island and the Olympic Peninsula of Washington. The decrease in frequency of occurrence and stature of the trees on the Islands may be partly because the northern limit of *T. plicata* is about 200 miles to the north in the Alaska panhandle. In addition, the establishment of seedlings is greatly retarded or eliminated because of severe browsing by the large population of deer on the Islands.

Sparganiaceae

Sparganium

Fruiting heads usually 1 cm or less in diameter; length of mature fruit with stigma and style less than 1.5 mm long

Pistillate heads 1 or 2, strictly axillary, sessile or short pedunculate; length of stigma and style in mature fruit about 1 mm in length or less ..... *S. minimum*

Pistillate heads 1, 2, and commonly 3, at least one head supra-axillary, lower head usually conspicuously pedunculate; length of stigma and style in mature fruit about 0.5 mm in length or less ..... *S. hyperboreum*

Fruiting heads usually 1.5 cm or more in diameter; length of mature fruit with stigma and style more than 2 mm long ..... *S. simplex*

46. Sparganium hyperboreum Laest. ex. Beurl., Sv. Vet.-akad. Öfv. Förh. 9: 192. 1852.

GRAHAM ISLAND: between Ells and Mercer pts., *CST22883;* Newton Pt., *CST22982;* Pure Lake, *CT36098.*

MORESBY ISLAND: Chaatl Narrows, *CST21776;* White Swan Bog, *CST21937;* below Newcombe Peak, *CST22045;* Bigsby Inlet, *CST22160;* Mosquito Mtn., *CT23726;* Upper Victoria Lake, *CT35741;* Kootenay Inlet, *CT36138;* Mike Inlet, *CT36670.*

Sparganium hyperboreum is a widespread circumpolar species (Hultén, 1962, Map 32). A few collections from British Columbia are atypical and show tendencies toward *S. simplex* Huds. or *S. minimum* Fries and no doubt represent plants of hybrid origin. A few of our herbarium specimens from northern Europe have also been identified as hybrids.

On the Queen Charlotte Islands *S. hyperboreum* usually occurs in the mountain ranges, whereas *S. minimum* is strictly a lowland species.

47. Sparganium minimum E. M. Fries, Summa Veg. Scand. 2: 560. 1849.

GRAHAM ISLAND: about 9 mi S of Juskatla, *T72;* Yakoun Lake, *CT36766.*

MORESBY ISLAND: Red Mud Marsh, *CST23196, CT36724;* between Gray and Sheldens bays, *CST23445;* about 2 mi S of Sandspit, *CT36085.*

Sparganium minimum is a common element of grass-sedge swamps and pools throughout the central interior region of British Columbia. At the coast it occurs in the eastern lowlands of Vancouver Island and on the Queen Charlotte Islands. The gap in its Cordilleran distribution shown by Hultén (1962, map 93) is apparently due to the lack of specimens that were available for study from this region. Examination of our herbarium material indicates a continuous distribution for this species from Alaska south to California and east to the Atlantic coast.

48. Sparganium simplex Huds., Fl. Angl. ed. 2. 401. 1778.

GRAHAM ISLAND: about 1½ mi W of Tow Hill, *CST22719;* about 3 mi NW of Tlell, *CST23472, CST23473;* about 4 mi N of mouth of Oeanda River, *CT35874;* Yakoun Lake, *CT36791;* about 1½ mi W of Yakan Pt., *CT36820.*

MORESBY ISLAND: Skidegate Lake, *CST21950, CT23645;* about 1 and 2 mi south of Sandspit, *CST23227, CT36033;* Sunday Inlet, *CT36584;* Mike Inlet, *CT36669.*

Sparganium simplex is a circumboreal species that has a wide distribution in northern regions of North America. In the western part of the continent it extends from Alaska southwards to Colorado and California. This species is part of a complex which in North America includes *S. angustifolium* Michx. and *S. multipedunculatum* (Morong) Rydb. The first North American monograph of *Sparganium* was undertaken by Morong (1888), who recognized a single species in this complex, *S. simplex,* with two varieties: var. *multipedunculatum* Morong and var. *angustifolium* (Michx.) Engelm. The latter entity was actually first recognized at varietal rank by Torrey (1843, p. 249) and the combination should not be credited to Engelmann (1867, p. 481). In 1909 Rydberg recognized the three entities included in Morong's earlier monograph as distinct species, *S. simplex, S. angustifolium* and *S. multipedunculatum.* It is interesting to note that Morong (1888, p. 79) proposed the new variety *multipedunculatum* on the basis of peduncle, nutlet, scale and stigma characters. Rydberg (1905, p. 599) recognized *multipedunculatum* at specific rank on the basis of Morong's description and the presence of broad scarious margins of the leaf sheaths. However, in his description of *S. simplex* and *S. multipedunculatum* in *North American Flora* (1909, p. 8, 9), Rydberg indicates that both species have scarious-margined leaf sheaths. In 1907, Fernald and Eames recognized both *S. simplex* and its "poorly" understood western variety *multipedunculatum.* In a later discussion of the occurrence in the east of the hitherto western species *multipedunculatum,* Fernald (1925*a*) outlines the defining characters of *S. angustifolium, S. simplex* and *S. multipedunculatum.* At this time he recognized that *S. simplex* was a European species and was apparently not present in North America, but was represented by the closely allied *S. multipedunculatum.* The confusion of the nomenclatural status and natural affinities of *S. simplex* for North America resulting from the treatments by Rydberg and Fernald is even found in Hultén's discussion of this species for Alaska. Hultén (1941, p. 93) recognizes both *S. simplex* and *S. angustifolium,* the former being probably restricted to southeastern Alaska. He states that large-grown and broad-leaved specimens of *S. angustifolium* from Alaska are similar to those found in Scandinavia, where *S. angustifolium* is known to be a very variable species. However, this statement is rather confusing as *S. angustifolium* is always considered to have smaller and narrower leaves than *S. simplex,* and in all probability the Alaskan population discussed by Hultén should be interpreted as *S. simplex.* In a more recent discussion of *S. simplex,* Hultén

(1962, p. 162) treats all North American material as *S. multipedunculatum* and completely disregards *S. angustifolium*. This decision is apparently based on Fernald's 1925 discussion of this entity. One western author, Howell (1903, p. 668), retained *S. simplex* as the only entity and recognized the floating, aquatic form with narrow leaves as var. *angustifolium,* thus following Morong's more conservative treatment.

In an attempt to understand the confusing taxonomic treatments accorded the *S. simplex* complex, we have examined a large series of specimens from Europe and North America. Careful attention was given to the characters that have been used by Fernald and Rydberg for separating the entities: type and length of stigmas, number of staminate capitula and their disposition, width of leaves and their degree of basal dilation, size of pistillate heads, anther length, and width of space between major veins in the leaves. The result of our study has indicated that these diagnostic characters are quite variable and thus unreliable. Furthermore, if morphological characters are correlated with the habitat, it becomes quite clear from the study of mass collections of the same species growing both on muddy shorelines and in varying stages of submergence in adjacent lake waters, that great variation can be observed, particularly in leaf characteristics. We have reached the conclusion that we should follow the conservative treatments of Morong and Howell. Howell *(loc. cit.)* and Torrey (1843, p. 249) both indicate that the narrow-leaved var. *angustifolium* is a form restricted to aquatic habitats, whereas broader-leaved specimens are found on the adjacent shores. Although we recognize only a single entity in this complex, it would be surprising if segregates did not occur in such a wide-ranging species. The complex clearly needs a careful biosystematic study in the light of the variable nature of the morphological characters and the wide range of habitats in which the plant grows. Mass collecting and uniform environmental studies are necessary before any further taxonomic considerations can be proposed.

Sparaganium simplex occurs in the cold freshwater lakes and slow-moving streams on the Islands, but two collections from west of Tlell are from roadside ditch pools beside the extensive sphagnum bogs in this region. Variation in size, length and degree of inflation of the leaf bases occurred in specimens taken from the same station and these differences support our conclusion concerning the unreliability of such characters in segregating taxa within this complex.

Zosteraceae

Marine plants; flowers many on one side of a flattened axis in leaflike spathes	
Plants with irregularly knotted rhizoma acting as holdfasts; leaves inconspicuously 3-veined; leaf sheaths with hyaline margins	*Phyllospadix*
Plants with creeping rhizomes, rooting at nodes; leaves prominently 5- or more veined; leaf sheaths lacking hyaline margins	*Zostera*

Freshwater or brackish-water plants; flowers one to many, axillary or in terminal spikes, never in a spathe
Carpels in fruit sessile; stamens 4 ..... *Potamogeton*
Carpels in fruit conspicuously stipitate; stamens 2 .... *Ruppia*

Phyllospadix

49. Phyllospadix scouleri Hook., Fl. Bor.-Amer. 2: 17. 1834.

MORESBY ISLAND: Chaatl Narrows, *CST21790;* Limestone Island, *CTS34823;* Gowdas Islands, *CT36574.*

As most herbarium material of *Phyllospadix* lacks flowers or fruits, it is difficult to identify and to assess the distribution of the two species that occur on the west coast, *P. scouleri* and *P. torreyi* S. Wats. However, the flat, thin leaves and single basal spadix of the specimens we have collected along the British Columbia coast seem to conform to the general description of *P. scouleri* given by Dudley (1894). We have experienced difficulty in determining whether sterile vegetative specimens are *Phyllospadix* or *Zostera,* as all floras separate the two genera on the bases of dioecious flowers and cordate-sagittate fruits of *Phyllospadix* as opposed to monoecious flowers and ovoid fruits of *Zostera,* and no attention in keys has been given to the utilization of vegetative characters. The following characters have been found useful for distinguishing *vegetative, sterile* plants:

(A) External characteristics:
Thickened rootstocks with lobed tuberlike, irregularly knotted rhizoma acting as holdfasts on rocky substrata; leaf sheaths prominently hyaline-margined; internodes inconspicuous; leaves inconspicuously 3-veined ..... *Phyllospadix*
Slender rootstocks with nonthickened creeping rhizomes with abundant roots at the nodes and not attached to rocky substrata; leaf sheaths without prominent hyaline margins; internodes conspicuous; leaves prominently 5- or more veined ..... *Zostera*

(B) Internal characteristics from leaf cross sections:
Lacunae absent; prominent groups of (3-) 8-20 cells of sclerenchyma occurring irregularly throughout the leaf occurring immediately beneath the epidermis; margin of leaf acute, ending in a single large apiculately tipped cell ..... *Phyllospadix*

Prominent large lacunae separated by bands of uniseriate parenchyma throughout the leaf; small groups of 2-5 cells of sclerenchyma occur immediately beneath the epidermis and immediately above each of the uniseriate parenchyma bands; margin of leaf blunt, composed of many similarly shaped epidermal cells ..... *Zostera*

Phyllospadix scouleri was collected in tidal pools along rocky shorelines and once as part of flotsam on a beach near Chaatl Island. Dr. E. L. Bousfield of the National Museum noted (pers. comm.) eight stations for this species on the north and west coasts in a survey of the Islands in 1957. This species is normally found clinging to submerged rocky substrata that may be covered with sand and subjected to heavy surf action.

Potamogeton

Submerged and floating leaves different and distinct
- Submerged leaves linear or terete, up to 1.5 mm wide; floating leaves petiolate, petioles 6-12 cm long, blades elliptical, 1.2-4.0 cm wide, 23-27-nerved, base cuneate to rounded, never gradually tapering to petiole, apex blunt ..... *P. natans*
- Submerged leaves linear-lanceolate to lanceolate, 2.5-15 mm wide, never terete; floating leaves petiolate, blades elliptical, 1.0-3 cm wide, 13-23-nerved, base gradually tapering into the petiole, apex acute
  - Submerged leaves linear-lanceolate, ribbonlike, often appearing 2-ranked; upright submerged stems never conspicuously branched ..... *P. epihydrus*
  - Submerged leaves lanceolate, never ribbonlike; upright submerged stems conspicuously branched, each branch with a terminal cluster of leaves ..... *P. gramineus*

Leaves all similar and usually submerged
- Leaves linear, less than 1.5 mm wide, 3-nerved or less
  - Stipules adnate to basal portion of leaf; leaves single-nerved, entire lamina consisting of large lacunate cells ..... *P. pectinatus*
  - Stipules not adnate to leaf; leaves 3-nerved with laterals weak, 1-2 rows of lacunate cells along midrib ..... *P. berchtoldii*
- Leaves linear-lanceolate, elliptic, or cordate, 1.5-90 mm wide, 7-60-nerved

Stipules becoming fibrous at maturity
Leaves cordate, clasping, undulate-margined, not strictly two-ranked; stipules soon disintegrating into stringy white divergent fibers ..... *P. richardsonii*
Leaves linear-lanceolate, not clasping or undulate-margined, strictly two-ranked, plumose; stipules soon disintegrating into coarse fibers that closely invest the internode above ..... *P. robbinsii*
Stipules never becoming fibrous at maturity
Leaves lanceolate to elliptic, upper ones petiolate, lower ones sessile, 9-15-nerved; stipules acute-tipped ..... *P. nodosus*
Leaves linear-lanceolate to lanceolate, all sessile, 5-60-nerved; stipules blunt-tipped
Leaves linear-lanceolate, ribbonlike, never more than 6 mm wide, green *P. epihydrus*
Leaves lanceolate, never ribbonlike, up to 15 mm wide, rufescent or green
Leaves rufescent, blunt-tipped; stems not conspicuously branched ..... *P. alpinus*
Leaves green, acute-tipped; stems conspicuously branched ..... *P. gramineus*

50. Potamogeton alpinus Balbis ssp. **tenuifolius** (Raf.) Hult., Fl. Aleut. Is. 65. 1937.
P. alpinus var. *tenuifolius* (Raf.) Ogden, Rhodora 45: 90. 1943.

GRAHAM ISLAND: Jalun Lake, *CT35629*.

Potamogeton alpinus is widely distributed throughout the northern hemisphere and is represented in eastern Asia and North America by ssp. *tenuifolius*. This subspecies is distinguished from the typical phase by its smaller and narrower leaves with acute or subacute tips and a less rigid, often weak beak on the fruit (Ogden, 1943, p. 90-98).

This species was collected only once during our two summer surveys. It was found at the west end of Jalun Lake in the shallow water of a sluggish stream at the edge of a sedge meadow. No flowering or fruiting material was observed.

51. Potamogeton berchtoldii Fieber, Potamogeta Böhmens 40. 1838.

Leaves 1.0-2.8 mm wide, at least a double row of lacunate cells along midrib below middle of leaf ..... ssp. *berchtoldii*
Leaves less than 1.0 mm wide, usually a single row of lacunate cells along midrib below middle of leaf ..... ssp. *tenuissimus*

51a. Potamogeton berchtoldii Fieber ssp. **berchtoldii**

GRAHAM ISLAND: Yakan Pt., *CST21320.*

MORESBY ISLAND: Sandspit, *CST21869;* Mosquito Lake, *CT23682;* Skidegate Lake, *CT36059;* between Skidegate Lake and Copper Bay, *CT-35259;* White Swan Bog, *CT35297.*

51b. Potamogeton berchtoldii Fieber ssp. **tenuissimus** (Mert. & Koch) Calder & Taylor, Can. J. Bot. 43: 1388. 1965.

P. pusillus var. *tenuissimus* Mert. & Koch in Röhling, Deutschl. Fl. ed. 3. 1: 857. 1823; *P. berchtoldii* var. *tenuissimus* (Mert & Koch) Fernald, Rhodora 42: 246. 1940.

GRAHAM ISLAND: 2½ mi S of Tlell, *CST23403;* 8 mi NW of Tlell, *CST23497;* 2 mi NW of Tlell, *CT35688.*

MORESBY ISLAND: Sandspit, *CST23228.*

Potamogeton berchtoldii is discussed by Fernald (1932b) under *P. pusillus* L. and the nomenclatural aspects of this species have been elucidated by Mason (1957, p. 71).

This species is occasional to abundant in shallow, clear, fresh-water ponds or lakes that have a sand or silt bottom and is usually associated with *Sparganium* and *Carex* species. The identification of the two subspecies is greatly facilitated by floating specimens out under water onto paper before they are pressed and dried.

52. Potamogeton epihydrus Raf. ssp. **nuttallii** (Cham. & Schlecht.) Calder & Taylor, Can. J. Bot. 43. 1388. 1965.

P. epihydrus Raf., Med. Repos. II. 5: 354. 1808.

P. nuttallii Cham. & Schlecht., Linnaea 2: 226. 1827; *P. epihydrus* var. *nuttallii* (Cham. & Schlecht.) Fernald, Mem. Gray Herb. 3: 115. 1932.

GRAHAM ISLAND: Tow Hill, *CST21291;* 2 mi NW of Tlell, *CT35694;* Yakoun Lake, *CT36792.*

MORESBY ISLAND: between Gray and Sheldens bays, *CST23444;* Mosquito Lake, *CT23658;* 2 mi S of Sandspit, *CT36084.*

Potamogeton epihydrus, a widely distributed North American species that occurs in lakes, small ponds and roadside ditches, is one of the most common species of *Potamogeton* on the Charlottes. Extensive colonies were found in both Mosquito and Yakoun lakes, and abundantly fruiting plants were observed in a small spring-fed roadside ditch south of Sandspit. This species is often associated with *P. natans* L., *Ranunculus aquatilis* L., *Sparganium simplex* Huds. and *Callitriche heterophylla* ssp. *bolanderi* (Hegelm.) Calder & Taylor.

53. Potamogeton gramineus L., Sp. Pl. 1: 127. 1753.
P. heterophylla sensu Abrams, Ill. Fl. Pacif. States 1: 86. 1923.

GRAHAM ISLAND: Marie Lake, *T99.*

MORESBY ISLAND: Skidegate Lake, *CT36056;* Mosquito Lake, *CT36721.*

This species is widely distributed throughout the northern hemisphere. On the Queen Charlotte Islands it was found in three clear-water lakes with sand or silt bottoms. Variation in size and coloration of leaves appears to be correlated with the depth of water in which plants grow. Plants collected in up to 5 ft of water in Mosquito Lake were growing profusely and some branches nearly reached the lake surface. No flowering or fruiting material was seen on such plants, but abundant flowers and fruits were observed on plants growing in 2 to 3 ft of water in nearby Skidegate Lake. At this latter locality large colonies were noted on the extensive silt delta at the east end of the lake.

54. Potamogeton natans L., Sp. Pl. 1: 126. 1753.

GRAHAM ISLAND: between Tow Hill and Rose Spit, *CST21228;* near mouth of Oeanda River, *CT35903;* Yakoun Lake, *CT36793.*

MORESBY ISLAND: Red Mud Marsh, *CT35372;* Upper Victoria Lake, *CT35782;* Skidegate Lake, *CT36055;* 2 mi S of Sandspit, *CT36086;* Mosquito Lake, *CT36720.*

This widely distributed northern-hemisphere *Potamogeton* is one of the most common species of the genus on the Queen Charlotte Islands. It was noted in many of the numerous large bog or marsh ponds and is frequently associated with species of *Sparganium* and *Nuphar lutem* ssp. *polysepalum* (Engelm.) Beal. *Potamogeton natans* grows as a submerged aquatic or is a partially submerged mud-flat species and it can apparently tolerate both semiboggy and clear-water conditions. It was noted as a particularly common element of the swampy ponds between old beach ridges near both Sandspit and Rose Spit.

55. Potamogeton nodosus Poir. in Lam., Encycl. Méth. Bot. Suppl. 4: 535. 1816.
P. americanus Cham. & Schlecht., Linnaea 2: 226. 1827.

GRAHAM ISLAND: Tow Hill, *CST22751;* between Ells and Mercer pts., *CST22926;* Yakoun Lake, *CT36796.*

MORESBY ISLAND: Skidegate Lake, *CST21959, CT35149;* Upper Victoria Lake, *CT35769.*

Potamogeton nodosus is a cosmopolitan species that is widely distributed throughout the central and southern regions of North America. On the Queen Charlotte Islands it is a species that can tolerate semiaquatic habitats such as

mucky flats, marshy meadows and wet sandy beaches. It is the only *Potamogeton* that was found in a subalpine situation, in shallow pools on open windswept rock bluffs, on the west coast of Graham Island. The records of *P. nodosus* from the Islands represent the northernmost records for this species along the Pacific coast.

56. Potamogeton pectinatus L., Sp. Pl. 1: 127. 1753.

GRAHAM ISLAND: Tlell, *CST21380.*

Potamogeton pectinatus is a distinctive species, widespread on the mainland, but on the Queen Charlotte Islands only observed and collected near the Richardson Ranch at Tlell. At this station abundant fruiting material was found in a small muddy creek that flows into the Tlell River.

57. Potamogeton richardsonii (Bennett) Rydb., Bull. Torrey Club 32: 599. 1905.

GRAHAM ISLAND: Yakoun Lake, *CT36797.*

MORESBY ISLAND: Mosquito Lake, *CT23659.*

Potamogeton richardsonii is a common aquatic species of lakes and ponds on the mainland of British Columbia. This distinctive species was observed and collected at only two localities on the Queen Charlotte Islands and its apparent scarcity is probably due to the lack of large, clear-water lakes with sandy bottoms.

58. Potamogeton robbinsii Oakes, Mag. Hort. Hovey 7: 180: 1841.

MORESBY ISLAND: Skidegate Lake, *CT36058.*

Potamogeton robbinsii is widely distributed throughout the western United States and British Columbia and it extends eastward to the Atlantic coast. This species rarely flowers or sets fruit and it has been suggested that it may represent a sterile hybrid. A discussion on the validity of this hypothesis is given by Mason (1957, p. 57).

This species was collected in about two feet of water on the silty bottom along the north side of Skidegate Lake. Only a few plants were noted and all were in early stages of vegetative development. This is apparently the northernmost record for this species along the Pacific coast.

Ruppia

59. Ruppia maritima L., Sp. Pl. 1: 127. 1753.

GRAHAM ISLAND: Tlell, *CST21381, CST23252, CT35936;* McClinton Bay, *CST21656;* Juskatla, *S3525;* Kumdis Creek Delta, *CT36125;* Naden Harbour, *CT36860.*

MORESBY ISLAND: Copper Bay, *CTS21874;* Sheldens Bay, *CTS-23437;* Rose Inlet, *CT37000.*

Over a period of 15 years Setchell (1946) carried out detailed experimental and field studies on members of the genus *Ruppia* that occur along the Pacific coast. He finally concluded that only two species, *R. spiralis* L. and *R. maritima,* occurred in this area and that the only morphological character between them which showed a clear-cut discontinuity was the type of peduncle. In *R. spiralis* the peduncles are spirally coiled but in *R. maritima* they are straight or flexuous. Hultén only reports *R. spiralis* from Alaska and indicates that only this species and *R. occidentalis* S. Wats. occur along the Pacific coast. We have not seen any of the collections referred to by Hultén, but we have verified that all collections of *Ruppia* from the Northwest Pacific coast in the herbaria of the National Museum and this institute belong to *R. maritima.*

In spite of the few stations recorded, this species of brackish habitats probably occurs throughout the Charlottes. It was collected along the east coast, around Masset Inlet and there are isolated stations at Naden Harbour and Rose Inlet.

Zostera

60. Zostera marina L., Sp. Pl. 2: 968. 1753.

GRAHAM ISLAND: Jungle Beach, *CST20932;* western outskirts of Queen Charlotte City, *CST22476, CST23448, CST23449;* Image Pt., *CST-23264;* Kumdis Creek Delta, *CT36126;* Naden Harbour, *CT36852;* Skidegate, 1897, *Newcombe* (V).

MORESBY ISLAND: Sandspit, *CST21078;* head of Cumshewa Inlet, *CST21966;* Richardson Island, *CTS34919;* Kootenay Inlet, *CT36215.*

Zostera marina of the Pacific coast of North America extends from the Bering Sea south to Lower California. Several varieties have been described by Setchell (1929) in an extensive report on the morphology and development of this species. He concluded that the varietal differences represented only different degrees of development and robustness that probably could be correlated with environmental conditions along the coast. In a later taxonomic study of the genus, Setchell (1933) regarded these morphological differences as part of the normal variation within the taxon and included the varieties *stenophylla* Asch. & Graebn., *angustifolia* Hornem., and *latifolia* Morong in the synonymy of *Z. marina.* The material from the Queen Charlotte Islands has 16 to 18 costa per seed and the leaves vary in width, but the variation is well within the range ascribed to *Z. marina* by Setchell. The characters used for distinguishing *Phyllospadix* from *Zostera* in vegetative condition are discussed under *P. scouleri* Hook.

This interesting marine plant forms large colonies usually on a muddy substrata in zones of low salinity, for example, Masset Inlet and the mouths of other rivers that empty into protected bays and inlets. It also occurs in spray

pools along the outer coast and occasionally below high-tide mark on sandy beaches in places where there is weak wave action. It is most common along the east coast as a constituent of flotsam and Dr. E. L. Bousfield of the National Museum reports (pers. comm.) observing it in suitable habitats along the west coast of the Charlottes. Abundantly fruiting populations were noted in August near Skidegate Village and Queen Charlotte City.

Juncaginaceae

Triglochin

Plants robust; carpels usually 6; fruit oblong, thick, obtuse at base; stigmatic surface inconspicuously covered with short (less than 0.2 mm long) red or purplish hairs ..... *T. maritimum*

Plants delicate; carpels 3; fruit narrowly clavate, tapering at base; stigmatic surface conspicuously covered with hyaline hairs up to 1.5 mm long ..... *T. palustre*

61. Triglochin maritimum L., Sp. Pl. 1: 338. 1753.

GRAHAM ISLAND: mouth of Sangan River, *CST21145;* McClinton Bay, *CST21681;* mouth of Kumdis Creek, *CST22110;* west of Queen Charlotte City, *CST22473, CT35418;* Masset, *CST22803;* Dawson Inlet, *CST22836;* Lina Island, *CST22912;* Yakoun River Delta, *CT35472.*

MORESBY ISLAND: Copper Bay, *CST21880;* head of Cumshewa Inlet, *CST21992;* Anna Inlet, *CT34925;* Mike Inlet, *CT36662.*

We are following most recent authors in treating our Island material as *T. maritimum.* A recent biosystematic study of the *T. maritimum* agg. by Löve and Löve (1958) unfortunately does not include examination of herbarium material or present any documented chromosome counts for the extensive Pacific Northwest populations.

Triglochin maritimum is a common element of tidal meadows and saline beaches along the outer coasts and in Masset Inlet.

62. Triglochin palustre L., Sp. Pl. 1: 338. 1753.

GRAHAM ISLAND: Delkatla Inlet, *CST22800, CT35588.*

MORESBY ISLAND: Upper Victoria Lake, *CT35739.*

Hultén (1962, p. 113, Map 104) has mapped this species as occurring in three separate areas in western Canada. His distribution patterns are unrealistic as this species is widely distributed throughout central British Columbia, Mackenzie District, Saskatchewan and Alberta.

Triglochin palustre is a rare species on the Queen Charlotte Islands found only in mucky depressions on wet flats back of a beach ridge in Delkatla Inlet near Masset and in muddy drainage courses in a sphagnum bog adjacent to Upper Victoria Lake.

Hydrocharitaceae

Elodea

63. Elodea canadensis Michx., Fl. Bor.-Amer. 1: 20. 1803.
Anacharis canadensis (Michx.) Planchon, Ann. Sci. Nat. Bot. III. 9: 75. 1849.

MORESBY ISLAND: Skidegate Lake, *CT23414, CT36057;* Mosquito Lake, *CT23654.*

Elodea canadensis prefers quiet, neutral or alkaline waters. Although it was only found in two lakes it probably occurs in some of the other large lakes in the lowlands of Graham and Moresby islands. It will not tolerate strongly acidic conditions and is likely absent from the many ponds and small lakes that are scattered throughout the extensive sphagnum bogs of eastern Graham Island. Flowering specimens were collected in shallow water in a muddy bay at the east end of Skidegate Lake on August 12, 1957, and 10 days later a few vegetative plants were found in about five feet of water in nearby Mosquito Lake. The collections cited apparently represent its northern limit along the Pacific coast as it was not reported for Alaska by Hultén.

Gramineae

Spikelets with 2 (rarely 1) staminate, sterile, or rudimentary lemmas unlike and below the fertile lemma; no sterile or rudimentary florets above (*Phalarideae*)
- Panicles short, compact, cylindrical, not evidently branched; lemmas often conspicuously awned .... *Anthoxanthum*
- Panicles long and narrow, or pyramidal, conspicuously branched; lemmas awnless
  - Panicle branches stiff, erect, many-flowered; spikelets green or yellowish ..... *Phalaris*
  - Panicle branches filiform, lax, few-flowered; spikelets brown ..... *Hierochloë*

Spikelets without sterile lemmas below the perfect floret
- Spikelets sessile on a continuous rachis of the spike (*Hordeae*)
  - Spikelets solitary at each node of the rachis
    - Spikelets placed edgewise to the rachis, one glume lacking ..... *Lolium*
    - Spikelets placed flatwise to the rachis, both glumes present ..... *Agropyron*

Spikelets usually 2 or 3 at each node of the rachis
Spikelets 1-flowered, in threes at each node of the rachis, the lateral pair pedicelled and usually reduced to awns ..... *Hordeum*
Spikelets 2-6-flowered, usually in twos at each node of the rachis, all alike ..... *Elymus*
Spikelets pedicellate in open or contracted (sometimes spikelike) panicles
Spikelets 1-flowered (*Agrostideae*)
Rachilla articulate below the glumes, the spikelets falling entire
Panicles dense and spikelike ..... *Alopecurus*
Panicles open, branches spreading and drooping ..... *Cinna*
Rachilla articulate above the glumes
Panicles dense, cylindric, not interruptedly glomerate
Glumes compressed-carinate, awn-tipped; blades flat ..... *Phleum*
Glumes not compressed-carinate, awnless; blades involute ..... *Ammophila*
Panicles open, pyramidal or more or less contracted but interruptedly glomerate
Florets bearing a tuft of hairs at the base; rachilla prolonged behind the palea .... *Calamagrostis*
Florets without conspicuous hairs at the base; rachilla not prolonged behind the palea (except in *Agrostis thurberiana* and *A. aequivalvis*) ..... *Agrostis*
Spikelets 2- to many-flowered
Lemmas awned from the back; glumes as long as the lowest floret (*Aveneae*)
Florets 2, one perfect, the other staminate ..... *Holcus*
Florets 2 or more, all alike except the upper ones reduced
Lemmas bifid at apex, awned between the lobes ..... *Danthonia*
Lemmas toothed, but not bifid and awned between the lobes (if bifid, awn straight)
Spikelets large; glumes more than 1.5 cm long ..... *Avena*
Spikelets small; glumes less than 1 cm long
Lemmas keeled, awn inserted above the middle ..... *Trisetum*

Lemmas rounded on the back, awn inserted below the middle
Rachilla prolonged behind the upper floret ..... *Deschampsia*
Rachilla not prolonged
Panicles open, branches drooping, blades flat, perennials .. *Vahlodea*
Panicles tightly congested or open spreading, branches never drooping; blade usually involute; annuals ..... *Aira*
Lemmas awnless or awned from the tip; glumes shorter than the first floret (*Festuceae*)
Spikelets of 2 forms, sterile and fertile intermixed; panicles dense, spiciform ..... *Cynosurus*
Spikelets all alike in the same inflorescence; panicles open or closed
Spikelets subsessile in dense one-sided clusters, the clusters in panicles ..... *Dactylis*
Spikelets not in dense one-sided clusters
Lemmas awned
Lemma tips bifid; grain pubescent at summit, adherent to palea ..... *Bromus*
Lemma tips acute; grain glabrous and free from palea ..... *Festuca*
Lemmas awnless
Glumes papery; upper florets sterile; culms bulbous at base ..... *Melica*
Glumes not papery; florets all alike; culms not bulbous at base
Lemma nerves nearly parallel, essentially not converging at the apex
Lemma nerves prominent; freshwater plants
Second glume 1-veined; lemmas 7-veined; sheaths closed to near top ..... *Glyceria*
Second glume 3-veined; lemmas 5-veined; sheaths open to base ..... *Torreyochloa*
Lemma nerves inconspicuous; saline plants ..... *Puccinellia*
Lemma nerves converging at the apex
Lemma tips acuminate, rounded on the back ..... *Festuca*

Lemma tips obtuse; keeled on the back ..... *Poa*

AGROPYRON

64. ***Agropyron repens** (L) Beauv., Ess. Agrost. 102, 1812.
Triticum repens L., Sp. Pl. 1: 86. 1753.

GRAHAM ISLAND: Queen Charlotte City, *CT36944, CT36980.*

MORESBY ISLAND: Sandspit, *CT36016, CT36489, CT37011.*

Agropyron repens, a native of Eurasia, has been widely introduced throughout North America. This species is one of our most persistent and noxious weedy grasses of cultivated fields, pastures and lawns. Two forms are often recognized: the awnless f. *repens,* and the awned f. *aristatum* (Schum.) Holmb. According to Bowden (pers. comm.) the ratio of awnless to awned forms in most populations is about two to one.

Surprisingly *A. repens* is not a serious weed on the Queen Charlotte Islands. Only a few colonies were noted in the settled areas around the east end of Skidegate Inlet.

AGROSTIS

Palea evident, nerved
- Rachilla prolonged behind palea as a bristle
  - Glumes 2.5-3.5 mm long; bristles conspicuous, 0.6-1.3 mm long; anthers 0.8-1.3 mm long; panicles open ..... *A. aequivalvis*
  - Glumes 1.5-2.5 mm long; bristles inconspicuous, minute, tufted; anthers 0.4-0.6 mm long; panicles semicongested ..... *A. thurberiana*
- Rachilla not prolonged
  - Panicles oblong, congested, branches appressed; culms decumbent at base; anthers 0.8-1.0 mm long ..... *A. palustris*
  - Panicles pyramidal, open, branches ascending; culms usually erect; anthers 1.3-1.7 mm long *A. gigantea*

Palea obsolete, or a minute nerveless scale
- Plants spreading by conspicuous rhizomes; panicles spikelike ..... *A. pallens*
- Plants caespitose without rhizomes, but stolons sometimes developed; panicles congested or open
  - Panicles narrow, dense, branches floriferous to near base, usually green; palea a nerveless scale less than 0.5 mm long ..... *A. exarata*
  - Panicles pyramidal, open and diffuse, branches floriferous only in upper half, usually purple; palea minute or absent

Panicles very diffuse; branches strongly scabrous, usually well over 5 cm long, branching above the middle; glumes 1.5-2.0 mm long	*A. scabra*
Panicles pyramidal; branches glabrous or more or less scabrous, less than 5 cm long, branching below middle; glumes 2.5-3 mm long	*A. borealis*

65. Agrostis aequivalvis (Trin.) Trin., Mém. Acad. St. Pétersb. VI. 4: 362. 1841. **Figures 106 and 107.**

Podagrostis aequivalvis (Trin.) Scribn. & Merr., U.S. Nat. Herb. Contr. 13: 58. 1910.

GRAHAM ISLAND: Empire Anchorage, *CS21536;* about 7 and 8 mi SE of Port Clements, *CST22087, CST22080A;* Langara Island, *CST22504;* Tow Hill, *CST22705;* between Ells and Mercer pts., *CST22897A;* Newton Pt., *CST-22974;* Shields Bay, *CT23327;* 3 and 4 mi NW of Tlell, *CST23486, CT35460;* 3 mi E of Juskatla, *CTS35046;* Jalun Lake, *CT35656;* about 4 mi N of mouth of Oeanda River, *CT35876;* Pure Lake, *CT36095;* Mayer Lake, *CT36106;* 11½ mi S of Masset, *CT36908.*

MORESBY ISLAND: Chaatl Narrows, *CST21762;* White Swan Bog, *CT35296;* Upper Victoria Lake, *CT35757;* Kootenay Inlet, *CT36189;* Takakia Lake, *CT36343;* Mosquito Mtn., *CT36464;* Sunday Inlet, *CT36587.*

Agrostis aequivalvis and *A. thurberiana* can be readily distinguished by the characters in the following summary.

	A. aequivalvis	**A. thurberiana**
glumes	2.5 - 3.5 mm long	1.5 - 2.5 mm long
bristles	0.6 - 1.3 mm long	minute, tufted, less than 0.6 mm long
anthers	0.8 - 1.3 mm long	0.4 - 0.6 mm long
habitat	lowland, rarely alpine; sphagnum bogs	alpine; runnels and meadows

Agrostis aequivalvis is an inconspicuous but very common element of all lowland bogs on the Charlottes that we surveyed. It reaches its best development in the stabilized open bogs that characterize much of the northeastern lowland of Graham Island but never forms dense colonies. *Agrostis aequivalvis* usually reaches full flower in late June or July and seed begins to fall in August.

We are following most authors in recognizing both this species and *A. thurberiana* Hitchc. as belonging to *Agrostis* rather than to *Podagrostis.* This latter genus was first recognized by Scribner and Merrill (1910, p. 58) for *P. aequivalvis* based on *Agrostis* sect. *Podagrostis,* a section proposed by Grisebach in Ledebour's *Flora Rossica.* At a later date Hultén (1937*a*, p. 75) transferred *A. thurberiana* to this new genus. *Podagrostis* was segregated from *Agrostis* on the basis of the presence of a prolonged rachilla, but the rachilla is often minute and inconspicuous in *P. thurberiana* and we believe that this character lacks significance for generic segregation.

Agrostis aequivalvis is limited in its distribution from the Cascades in Oregon to the western Aleutian Islands. In the northern part of its range it is essentially a lowland bog plant, whereas in the southern portion it is a subalpine



Figures 106–109. 106. *Agrostis aequivalis* (Trin.) Trin., habit (× ½). 107. *A. aequivalvis*, flower with detail of palea and bristle (× 15). 108. *Agrostis thurberiana* Hitchc., habit (× ½). 109. *A. thurberiana*, flower (× 20).

or alpine species. Nearly all collections from the Queen Charlottes are from lowland bogs, but three collections were made in the subalpine zone.

66. Agrostis borealis Hartm., Handb. Skand. Fl. ed. 3. 17. 1838.
A. oregonensis Vasey, Bull. Torrey Club 13: 55. 1886.
A. idahoensis Nash, Bull. Torrey Club 24: 42. 1897.
A. alaskana Hult., Fl. Aleut. Is. 71. 1937.
A. alaskana var. *breviflora* Hult., *l.c.*

GRAHAM ISLAND: 2½ mi E of Tow Hill, *CST22750;* between Ells and Mercer pts., *CST22897B;* Dawson Inlet, *CST22937;* Shields Bay, *CT23338;* between Skidegate and Skidegate Village, *CT35834;* Yakoun Lake, *CT36788.*

MORESBY ISLAND: head of Cumshewa Inlet, *CST22050;* Harriet Harbour, *CST22269A;* Hotspring Island, *CST22294, CST22305;* Mt. de la Touche, *CT23604, CT23606, CT23607;* Skidegate Lake, *CT23636;* Mosquito Mtn., *CT23709A, CT23743;* Mosquito Lake, *CT23759;* Mt. Moresby, *CT36437, CT36445, CT36508A;* Kaisun, *CT36549.*

Agrostis borealis is a widely distributed circumboreal species that is common throughout the Cordilleran region of North America as far south as Colorado. It includes a complex of forms segregated as *A. alaskana, A. oregonensis* and *A. idahoensis.* The characters of anther size and the presence of straight or geniculate awns have been used to segregate these forms but such characters have little diagnostic value when a large series of specimens is compared. In mass collections from various sites on the Queen Charlotte Islands and on the mainland we have found both awned and unawned plants in the same colony. The awns may be either straight or geniculate, short or long, and various types occur in varying frequency throughout the populations. If phenotypes are then correlated with geography there seems to be little consistency with known plant distributions from this region. On the basis of our morphological and geographical studies we cannot support the retention of four distinct taxa in the complex and we recognize but a single taxon, *A. borealis.*

The degree of variation within *A. borealis* can be attributed in part to the varied habitats that it tolerates. On the Charlottes we have collected this species in lowland coastal and interior sites, and in subalpine and alpine regions of the Queen Charlotte Ranges. It apparently does not invade disturbed habitats near settlements as do many other native grasses. *Agrostis borealis* is one of the dominant grasses around the margins of the hot-spring pools on Hotspring Island, but in most localities it is scattered and rarely forms pure stands.

67. Agrostis exarata Trin., Gram. Unifl. 207. 1824.
A. exarata var. *purpurascens* Hult., Fl. Aleut. Is. 73. 1937.

GRAHAM ISLAND: about 2 mi N of Skidegate, *CST22093;* W of Queen Charlotte City, *CST22466;* Langara Island, *CST22536;* Tow Hill, *CST22665;* between Lawn Pt. and Tlell, *CST23266;* Image Pt., *CT35390;* near mouth of

Oeanda River, *CT35888;* 4 mi S of Tlell, *CT35948;* Kumdis Creek Delta, *CT36122;* Yakoun Lake, *CT36747;* Naden Harbour, *CT36854;* mouth of Honna River, *CT36933.*

MORESBY ISLAND: islet off Bolkus Islands, *CST22227;* Hotspring Island, *CST22310;* Gray Bay, *CST23435;* Mt. de la Touche, *CT23608;* Kootenay Inlet, *CT36198;* Mt. Moresby, *CT36383, CT36415;* Kaisun, *CT36543;* Gowdas Islands, *CT36575;* Rose Inlet, *CT36991.*

Agrostis exarata, a widely distributed species of western North America, ranges from California to Alaska along the Pacific coast. There are also a number of records from interior British Columbia. The type of the species is based on collections from Unalaska at the eastern end of the Aleutian Chain. In general habit and floret characters our material from the Queen Charlotte Islands reveals a close correlation with material from the type area.

This species is a common element of the coastal vegetation on the Charlottes. It occurs in both disturbed and undisturbed habitats and, like *A. scabra* Willd., readily invades wet depressions along the disturbed margins of newly constructed roads. Occasional colonies of *A. exarata* are found in the lower subalpine zone of the Queen Charlotte Ranges.

68. ***Agrostis gigantea** Roth, Tent. Fl. Germ. 1: 31. 1788.

GRAHAM ISLAND: between Queen Charlotte City and Skidegate, *CT36237.*

MORESBY ISLAND: Gray Bay, *CST23428;* Alliford Bay, *CT36484;* Sandspit, *CT37012.*

This Eurasian species has been repeatedly introduced into many areas in the Pacific Northwest. We are following the treatment given in a British flora (Clapham *et al.,* 1962) in which this rhizomatous perennial bentgrass is recognized at *A. gigantea.*

This species is not widely distributed on the Queen Charlotte Islands, but a few large colonies were found near settled areas along the shoreline at the eastern end of Skidegate Inlet.

69. Agrostis pallens Trin., Mém. Acad. St. Pétersb. VI. 4: 328. 1841.

GRAHAM ISLAND: Masset, *Green* (UBC).

MORESBY ISLAND: Hotspring Island, *CST22306.*

Agrostis pallens is essentially a coastal species that is reported to range from California to Washington. There are, however, a few isolated records from British Columbia including the collections from the Queen Charlotte Islands. It was found in the grassy sward around the hot-spring pools on Hotspring Island. This collection and the Green record from Masset are the northernmost along the Pacific coast.

70. *__Agrostis palustris__ Huds., Fl. Angl. 27. 1762.
A. maritima Lam., Encycl. Méth. Bot. 1: 61. 1783.
A. stolonifera sensu Hult., Fl. Alaska & Yukon 2: 157. 1942.

GRAHAM ISLAND: Masset Spit, *CST22653;* Tow Hill, *CST22693;* Yakoun River Delta, *CT23500;* near mouth of Oeanda River, *CT35879;* Queen Charlotte City, *CT35913;* Tlell, *CT35921.*

MORESBY ISLAND: islet off Bolkus Islands, *CST22242B;* Gray Bay, *CT35243;* Alliford Bay, *CT36485.*

Agrostis palustris has been widely introduced in the coastal areas of North America, but native populations may also be present. The correct specific name for this entity is presently in a confused state and as regards the use of the epithet *palustris,* we are accepting the opinion of our colleague, Dr. W. G. Dore (pers. comm.).

On the Queen Charlotte Islands most of the collections were made in areas of known plant introduction, but such stations as Gray Bay, Oeanda River and the islet off Bolkus Islands probably represent indigenous colonies. All collections were made in maritime or semimaritime habitats and variation in habit can be attributed to the differing situations, such as shingle beaches, grassy swards along upper portions of beaches, and sand-beach ridges. All specimens from the Charlottes have semicongested narrow panicles.

71. **Agrostis scabra** Willd., Sp. Pl. 1: 370. 1789.
A. hiemalis (Walt.) B.S.P., Prelim. Cat. N.Y. 68. 1888.

GRAHAM ISLAND: about 4 mi S of Masset, *CST22807;* between Skidegate and Queen Charlotte City, *CST23261;* 11½ mi S of Masset, *CT36909.*

MORESBY ISLAND: Skidegate Lake, *CT23635, CT36735.*

Agrostis scabra, a widely distributed native species of North America, has had many segregates proposed. The plants from the Queen Charlotte Islands have prolonged, very acute, strongly scabrous glumes, and scabrous, capillary panicle branches. The awnless lemmas are considerably shorter than the glumes and the anthers are up to 3.5 mm long. These characters place the material from the Charlottes in the typical phase.

This species is an aggressive invader of newly disturbed habitats, such as road grades and logged-over forests. On the Queen Charlotte Islands it forms conspicuous colonies in such habitats, but it is undoubtedly indigenous along the shores of Skidegate Lake and on the undisturbed coastal bluffs near Skidegate.

72. **Agrostis thurberiana** Hitchc., Bull. U.S. Dept. Agr. Pl. Ind. 68: 23. 1905. **Figures 108 and 109.**
Podagrostis thurberiana (Hitchc.) Hult., Fl. Aleut. Is. 75. 1937.

MORESBY ISLAND: Takakia Lake, *CST23108;* Mosquito Mtn.,

CT23709B; between Cumshewa and Peel inlets, *CT35180;* Mt. Moresby, *CT36508.*

Agrostis thurberiana is restricted to subalpine and alpine regions of western North America. It extends into the Aleutian Island chain. The generic position and the distinguishing characters of this species are discussed under *A. aequivalvis* Trin.

This species is of local distribution on the Queen Charlotte Islands and is found only in the relatively small alpine region of the central mass of the Queen Charlotte Ranges. It usually occurs in wet, rocky runnels, but is occasionally found on open, wet rocky and heathy alpine slopes.

AIRA

Panicles open	*A. caryophyllea*
Panicles dense, spikelike	*A. praecox*

73. *Aira caryophyllea L., Sp. Pl. 1: 66. 1753.

GRAHAM ISLAND: Haida Pt., *CST20868;* Masset Spit, *CST21238;* 2½ mi SE of Port Clements, *CTS34594;* Tlell, *CTS 34636;* between Skidegate and Skidegate Village, *CT35835;* near mouth of Oeanda River, *CT35890.*

MORESBY ISLAND: Alliford Bay, *CST21066;* Sandspit, *CST21102.*

The European *A. caryophyllea* is widely introduced along the Pacific coast from California to the Queen Charlotte Islands. In British Columbia it is essentially a maritime species, but there are a few records inland as far east as Yale in the Fraser River valley. Hultén did not record this species when he prepared his treatment of the grasses for *Flora of Alaska and Yukon,* but in his supplement (1950, p. 1706) he reported a collection from Mile 988 on the Alaska Highway in Yukon.

Aira caryophyllea is common in the lowland sections of eastern Graham and northeastern Moresby islands. It was collected in open disturbed ground along roadsides, in grassy swards on sea bluffs and cliffs, and in gravelly or sandy areas on flats and dunes by the sea. In addition to the records cited it was noted on the sand beach at the mouth of the Sangan River and on cliffs at South Low Island.

74. *Aira praecox L., Sp. Pl. 1: 65. 1753.

GRAHAM ISLAND: Delkatla Inlet, *CST21292;* about 6½ mi E of Masset, *CT35602;* about 4 mi N of mouth of Oeanda River, *CT35873.*

MORESBY ISLAND: Hotspring Island, *CST22308;* Sandspit, *CST23845;* Tuft Islets, *CTS34872;* Gray Bay, *CT35245;* Kaisun, *CT36544.*

Aira praecox is strictly a coastal species that has its northern limit along the Pacific coast on the Queen Charlotte Islands, where it has apparently been established for many years. This European adventive is found in habitats

similar to those of *Aira caryophyllea* L. and the two species often grow in association. *Aira praecox* occurs along the north coast of Graham Island from near Masset to Rose Spit and extends south in the lowlands along the east coast as far as Hotspring Island. The only collection from the west coast is from Kaisun, where it is locally common in the meadow that fronts this abandoned Haida village.

Alopecurus

75. ***Alopecurus geniculatus** L., Sp. Pl. 1: 60. 1753.

GRAHAM ISLAND: Tow Hill, *CST21188;* about 2½ mi E of Masset, *CST21297;* Tlell, *CST21375, CTS34655;* Mamin River Delta, *T123, CT35549;* Yakoun River 4½ mi S of Port Clements, *CTS35042;* near mouth of Oeanda River, *CT35886.*

MORESBY ISLAND: between Sandspit and Cape Chroustcheff, *CST20980.*

Alopecurus geniculatus has been widely introduced from Eurasia along the Pacific and Atlantic coasts of North America. In the Pacific northwest this species occurs as far north as Juneau in the southeastern portion of the Alaskan panhandle.

On the Queen Charlotte Islands this species is a common element of the coastal flora in the eastern lowlands of Graham and Moresby islands. It is usually found near settlements in disturbed wet habitats.

Ammophila

76. ***Ammophila arenaria** (L.) Link, Hort. Berol. 1: 105. 1827. **Figure 49.**

GRAHAM ISLAND: Tlell, *CST23174, CT35426.*

This species was only found on sand beaches and dunes near Tlell, where it has become well established between the Richardson Ranch and the mouth of the Tlell River. Like *Elymus mollis* Trin., it is an excellent sand binder and apparently was introduced as an aid in controlling erosion.

Anthoxanthum

77. ***Anthoxanthum odoratum** L., Sp. Pl. 1: 28. 1753.

GRAHAM ISLAND: Mamin River Delta, *T120, CT35546.*

MORESBY ISLAND: between Sandspit and Cape Chroustcheff, *CST20986;* Harriet Harbour, *CST22269;* Gray Bay, *CT35241;* Sandspit, *CT35339.*

Anthoxanthum odoratum is widely introduced and well established in pastures and meadows in the coastal region of British Columbia. It prefers a maritime climate where there is high humidity, and consequently it has little chance of becoming established in the interior, where the summers are relatively dry and hot.

On the Queen Charlotte Islands it is essentially restricted to open grassy bluffs or meadows along the east coast, particularly in the vicinity of Queen Charlotte City and Sandspit. A single collection was made in a grassy playing field near the mouth of the Mamin River just east of Juskatla Logging Camp. The record from Harriet Harbour was made at the abandoned site of a Japanese shellfish cannery.

Avena

78. *Avena fatua L., Sp. Pl. 1: 80. 1753.

MORESBY ISLAND: Sandspit, *CT37010.*

Avena fatua is a common and widely distributed grain field weed throughout settled areas of Canada. It was only noted near Sandspit, where there has been continuous cultivation for a number of years. This species is not a serious weed on the Islands as cereal grains are usually rotated with leguminous forage crops.

Bromus

Plants annual; lemmas obtuse, bidentate	*B. mollis*
Plants perennial; lemmas acute, entire	
Lemmas compressed, conspicuously keeled, almost glabrous to scabrous or hirtellous	*B. sitchensis*
Lemmas not compressed or conspicuously keeled, strongly pubescent	*B. pacificus*

79. *Bromus mollis L., Sp. Pl. 1: 112. 1762.

GRAHAM ISLAND: Queen Charlotte City, *CST23000;* Tlell, *CTS34658, CT35920;* 2 mi E of Queen Charlotte City, *CTS34782;* Lawn Pt., *CT35445.*

MORESBY ISLAND: Sandspit, *CST23207, CT35166.*

Bromus mollis is a widely introduced annual in southern British Columbia especially on southern Vancouver Island and in the lower Fraser River valley at the coast. On the Queen Charlotte Islands it is common along roadsides in and near the settlements at the east end of Skidegate Inlet. It was also noted in many places along the shoreline road between Skidegate Village and Tlell. This species produces abundant seed and is well established in relatively dry disturbed habitats.

80. Bromus pacificus Shear, U.S. Dept. Agr. Div. Agrost. Bull. 23: 38. 1900.

GRAHAM ISLAND: Langara Island, *CST22539;* Yakoun River Delta, *CT23507;* near Juskatla, *S3520;* Naden Harbour, *CT36848.*

MORESBY ISLAND: mouth of Denna River, *CT23789;* Kootenay Inlet, *CT36201;* Kaisun, *CT36523*; Louscoone Inlet, Sept. 13, 1951, *Pillsbury* (UBC).

Bromus pacificus is strictly a coastal species ranging from the northern part of the Alaska panhandle south to Oregon. On the Queen Charlotte Islands it is found in meadows along the upper margins of sea beaches and in moist habitats in open woods at or near the coastline. This lowland species, which is only found in the western and central sections of the Charlottes, prefers a more mesic habitat than *B. sitchensis* Trin.

81. Bromus sitchensis Trin., Mém. Acad. St. Pétersb. VI. 2: 173. 1832.
B. aleutensis Trin. ex Griseb. in Ledeb., Fl. Ross. 4: 361. 1853; *B. sitchensis* var. *aleutensis* (Trin.) Hult., Fl. Alaska & Yukon 2: 254. 1942.

GRAHAM ISLAND: Tlell, *CST22102, CT35919;* Torrens Island, *CST22434, CT35825;* Tow Hill, *CST22682;* Lina Island, *CST22940;* Image Pt., *CT35395.*

MORESBY ISLAND: Alliford Bay, *CST21864;* South Low Island, *CTS34846;* Sandspit, *CT35327;* Kaisun, *CT36524.*

Hitchcock (1935, p. 36, 37) in his treatment of *Bromus* sect. *Ceratochloa* (Beauv.) Griseb. recognized two native perennial species as occurring along the Northwest Pacific coast. These two species, *B sitchensis* and *B. aleutensis,* which he stated ranged from Oregon to Alaska and Washington to the Aleutian Islands respectively, are distinguished essentially by the size and shape of the panicles, the length and attitude of the panicle branches, and the number of flowers in a spikelet. Hultén (1942, p. 254) also recognized the more northern phase as a distinct entity, but at varietal rank (var. *aleutensis*), and he suggested that if it was grown in a less harsh environment it might prove to be identical with the coastal plant that occurs to the south. We have examined a series of specimens of both species and have come to the conclusion that *B. aleutensis,* which is described as having erect panicles with rather stiff appressed ascending branches and few-flowered spikelets, is merely a somewhat more depauperate northern phase and should not be accorded formal taxonomic status. The other extreme is a plant that has a larger, somewhat more open panicle, with slender, divergent to slightly drooping branches, and this is the common phase in the southern part of the range. There is considerable variation in the population from the Queen Charlotte Islands and a few collections are considered to be intermediate between the two types.

This species is native to the eastern sections of Graham and Moresby islands, where it occurs in relatively dry habitats on open sea bluffs, in the

grassy zone along the upper margins of sea beaches, and occasionally in disturbed ground in the town sites. A single plant was found at Kaisun on the west coast in the meadow that fronts the abandoned Haida village. At one time there must have been a flourishing trade between the east and west coast villages and it seems logical to assume that *B. sitchensis* was introduced at this station.

Calamagrostis

Awns conspicuously longer than the glumes, geniculate — *C. purpurascens*
Awns included to slightly longer than the glumes, geniculate or straight
  Panicles open and loose when mature, usually more than 10 cm long and 3.5 cm wide; callus hairs as long as or longer than the lemmas; awns straight — *C. canadensis*
  Panicles somewhat open to dense and spikelike when mature
    Panicles stiff, dense and spikelike, nearly always less than 10 cm long and 3.5 cm wide; some of the callus hairs as long as the lemmas; awns straight — *C. crassiglumis*
    Panicles somewhat open to dense, often flexuous, more than 10 cm long; callus hairs less than half the length of the lemmas; awns straight or geniculate — *C. nutkaensis*

82. Calamagrostis canadensis (Michx.) Beauv., Ess. Agrost. 157. 1812.

GRAHAM ISLAND: Blackwater Creek, *S3537;* Mamin River Delta, *CT35543;* Yakoun Lake, *CT36758.*

MORESBY ISLAND: Skidegate Lake, *CST21951A, CT35273, CT36054;* Mt. Moresby, *CT36427;* Mosquito Lake, *CT36708.*

Hultén (1942, p. 160) in his treatment of the *C. canadensis* complex recognized two races in Alaska and Yukon, an essentially coastal population which he designated as *langsdorffii* (Link) Hult. and the plant of the interior which he referred to the typical phase. This species, however, is one of the most common, widely distributed and variable grasses in Canada and until the entire complex, which includes many infraspecific segregates, has been studied in detail we refer all collections from the Pacific Northwest to *C. canadensis* in the broad sense. It should be pointed out that *C. langsdorffii* is based on a cultivated garden plant and the application of this name at subspecific rank to the population along the Pacific coast is on tenuous grounds.

This species is locally common on the Charlottes in meadows bordering Mosquito, Skidegate and Yakoun lakes in the lowlands of eastern Graham and northeastern Moresby islands. It was also found on sandy banks near the mouth of the Mamin River and at nearby Blackwater Creek in the Juskatla area.

Calamagrostis canadensis is typically a lowland species of marshes and wet meadows, but a few plants were found on a stabilized talus slope at about 600 ft on the north-facing slope of Mount Moresby. They were associated with a number of alpine and subalpine species. There is a Dawson collection at the National Museum in Ottawa labeled "wet place, Queen Charlotte Islands, July 1878," but without specific locality data.

83. Calamagrostis crassiglumis Thurb. in S. Wats., Bot. Calif. 2: 281. 1880.
C. neglecta var. *crassiglumis* (Thurb.) Beal, Grasses N. Amer. 2: 353. 1896.

GRAHAM ISLAND: Yakan Pt., *CST22723;* Delkatla Inlet, *CT35590;* about 4 mi N of mouth of Oeanda River, *CT35860;* Yakoun Lake, *CT36759.*

MORESBY ISLAND: Upper Victoria Lake, *CT35744.*

This species is related to *C. neglecta* (Ehrh.) Gaertn. and *C. inexpansa* A. Gray. Beal (1896) treated it as a variety of the former, but if it is to be considered as a variety of one of these species we believe its affinities are with *C. inexpansa. Calamagrostis crassiglumis* is rare in British Columbia, being reported by Macoun (1888, p. 204) only from Nimpkish and Horne lakes on Vancouver Island. The only other records for the province are the ones cited from the Queen Charlotte Islands and a collection from between Roller Bay and Mexicana Point on Hope Island off the north end of Vancouver Island.

Calamagrostis crassiglumis is not well represented in our collections from the Charlottes. In northeast Graham Island it occurs in brackish meadows at Delkatla Inlet, in a grass-sedge swale back of the beach ridges at Yakan Point, and on grassy flats in sand blowouts in the dune area near Rose Spit. The other two records are from small wet meadows bordering the sand and gravel shorelines of Upper Victoria and Yakoun lakes.

84. Calamagrostis nutkaensis (Presl) Steud., Syn. Gram. 1: 190. 1854.
C. aleutica Trin. in Bong., Mém. Acad. St. Pétersb. VI. 2: 171. 1832.
Deyeuxia breviaristata Vasey, Bull. Torrey Club 15: 48. 1888.

GRAHAM ISLAND: Langara Island, *CST22534,* June 1, 1952, *Guiget* (V); Masset Spit, *CST22638,* Tow Hill, *CST22683;* Dawson Inlet, *CST22832;* between Ells and Mercer pts., *CST22896;* Tlell, *CST23156, CST23250;* Shields Bay, *CST23332;* 5 mi SE of Port Clements, *CST23475;* Yakoun River Delta, *CT23504;* 6 mi S of Juskatla, *CT35493;* about 15 mi S of Masset, *CT35578;* Delkatla Inlet, *CT35593;* about 4 mi N of mouth of Oeanda River, *CT35869;* Mayer Lake, *CT36105*; Naden Harbour, *CT36837.*

MORESBY ISLAND: Gray Bay, *CST23421;* Mt. de la Touche, *CT23597, CT23600;* Mosquito Lake, *CT23760;* Upper Victoria Lake, *CT35783;* Kootenay Inlet, *CT36204;* Mt. Moresby, *CT36427A;* Kaisun, *CT36522;* Yakulanas Bay, *CT36651;* Rose Inlet, *CT36992;* Cape Fanny, Aug. 8, 1957, *Mills.*

Calamagrostis nutkaensis is a most distinct species with stiff upright culms up to 12 dm high, short rhizomes, glabrous sheaths, and awns that are usually shorter, but occasionally slightly longer, than the glumes. Hultén (1942, p. 169) states that in typical specimens the awns are straight while in others, "with more or less purple coloured spikelets, which I suspect to be influenced by *C. canadensis* ssp. *Langsdorffii,* the awn is sometimes distinctly geniculated." On the other hand, Hitchcock (1935, p. 306, 307) in his key to *Calamagrostis* has placed *C. nutkaensis* in a group with geniculate awns. The collections from the Charlottes include both straight- and geniculate-awned plants, but the awn type cannot be correlated with panicle color. Over 50 percent of the collections from the Queen Charlotte Islands have more or less purplish spikelets, but there is no evidence that this species hybridizes with *Calamagrostis canadensis* (Michx.) Beauv. as inferred by Hultén.

Calamagrostis nutkaensis is one of the most common coastal grasses on the Islands. It is found in meadows along the upper limits of beaches back of the *Elymus mollis* zone, on open sea bluffs, along rocky shorelines and in many other seashore habitats. It is essentially a coastal species, but on the west coast of the Islands at Shields Bay and Fairfax Inlet, it was collected in forest openings on mountain slopes at 200 and 400 ft respectively and there are inland records from meadows along the shores of Mayer, Upper Victoria, and Mosquito lakes.

85. Calamagrostis purpurascens R. Br. ssp. **tasuensis** Calder & Taylor, Can. J. Bot. 43: 1388. 1965. **Figures 110-113.**

GRAHAM ISLAND: Empire Anchorage, *CS21456;* McClinton Bay, *CST21662;* between Ells and Mercer pts., *CST22928;* Newton Pt., *CST22966;* Shields Bay, *CT23279;* near Jalun Lake, *CT35644;* Long Inlet, *CT35976.*

MORESBY ISLAND: Bigsby Inlet, *CST22141;* Takakia Lake, *CST23126, CT36310;* Mt. de la Touche, *CT23571;* Mosquito Mtn., *CT23753;* Yatza Mtn., *CT35718;* Mt. Russ, *CT36192;* Mt. Moresby, *CT36507;* Sunday Inlet, *CT36639.*

Calamagrostis purpurascens R. Br. is a common and widely distributed grass of the Cordilleran region of western North America and is especially abundant east of the Coast Mountains. It extends eastward in the northern part of the boreal zone to the Atlantic coast and westwards throughout the Aleutian Islands to eastern and central Siberia. The population on the Queen Charlotte Islands is near the southern limit for this species along the Pacific coast and clearly represents a distinct race that has been designated as ssp. *tasuensis.* This subspecies can be readily distinguished from the typical phase by the following characters: awns conspicuous, usually 10 to 12 mm long; inflorescence an essentially open pyramidal panicle; rachilla half as long as the lemma or less; adaxial surface of leaves puberulous, never villous or sericeous; abaxial



Figures 110–113. *Calamagrostis purpurascens* R. Br. ssp. *tasvensis* Calder & Taylor. 110. Habit (× ½). 111. Flower (× 6). 112. Closed inflorescence (× ½). 113. Open inflorescence (× ½).

surface of leaves glabrous or minutely puberulous. These characters are in contrast to those possessed by the typical subspecies: awns often inconspicuous and only slightly exceeding glumes, 6 to 9 mm long; inflorescence a spikelike dense panicle; rachilla half as long as the lemma or longer; adaxial surface of leaves villous-sericeous, abaxial surface puberulous. The endemic ssp. *tasuensis* of the Queen Charlotte Islands has been discussed in detail in a recent paper by Calder and Taylor (1965).

On the Queen Charlotte Islands ssp. *tasuensis* is a common element of subalpine open rocky habitats. It occurs on talus slopes and in rocky runnels throughout the Queen Charlotte Ranges. It is a conspicuous species with open purplish pyramidal panicles. Although it is never a dominant element of the vegetation, it was noted throughout the mountainous regions of the Islands.

Cinna

86. Cinna latifolia (Trev.) Griseb. in Ledeb., Fl. Ross. 4: 435. 1853.

GRAHAM ISLAND: Blackwater Creek, *S3529;* Honna River, *CT36976.*

MORESBY ISLAND: about 3 mi S of mouth of Copper Creek, *CST21890;* Mt. de la Touche, *CT23609;* about 3 mi E of Skidegate Lake, *CT36070.*

Cinna latifolia is common along the British Columbia coast and in the interior, but there are no records from the Yukon and its distribution is sporadic in Alaska except in the panhandle, where it has been collected a number of times. This species was only noted five times in our two summer surveys of the Queen Charlotte Islands. It was collected in open woods along Blackwater Creek near Juskatla Logging Camp, in logged-over forest by Copper Creek between Skidegate Lake and Copper Bay, along the Honna River, and on a grassy talus slope below cliffs on the west slope of Mount de la Touche at about 400 feet.

Cynosurus

87. *Cynosurus cristatus L., Sp. Pl. 1: 72. 1753.

GRAHAM ISLAND: 2 mi E of Queen Charlotte City, *CTS34784;* Queen Charlotte City, *CTS35084;* between Skidegate and Skidegate Village, *CT35833.*

Cynosurus cristatus, a native of Eurasia, has been widely introduced in North America. On the Queen Charlotte Islands it is of local occurrence along roadsides in the vicinity of the settlements along the north shore of the eastern end of Skidegate Inlet.

Dactylis

88. *Dactylis glomerata L., Sp. Pl. 1: 71. 1753.

GRAHAM ISLAND: Torrens Island, *CST22437, CT35826;* Tow Hill, *CST22694;* small island near Skidegate, July 19, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: Alliford Bay, *CST21866;* Sandspit, *CT35157.*

This native of Eurasia and Africa is a common species in fields, waste places, and other disturbed habitats along the British Columbia – Alaska coast. There are a number of records from the interior of the province, but it apparently does not become well established in those areas that experience severe winters.

Dactylis glomerata is not common on the Queen Charlotte Islands and never forms large colonies. All records but one are from near settlements at the east end of Skidegate Inlet, where it has probably been introduced a number of times.

Danthonia

Panicles open; pedicels spreading and usually reflexed .. *D. californica*
Panicles congested; pedicels ascending, appressed ..... *D. intermedia*

89. Danthonia californica Boland., Proc. Calif. Acad. 2: 182. 1863.

MORESBY ISLAND: Mosquito Lake, *CT36705.*

Danthonia californica, a widely distributed species of western North America, is comprised of two poorly defined races. In British Columbia it is known only from Vancouver Island and the Queen Charlotte Islands. The typical phase has glabrous leaves, whereas those of var. *americana* (Scribn.) Hitchc. are usually conspicuously pilose with spreading hairs. The latter variety is stated to be a less robust plant with smaller spikelets, but these characters seem to be of little diagnostic significance. Both varieties occur in the drier eastern sections of Vancouver Island and apparently their ranges on the island are essentially sympatric. On the basis of British Columbia material we have not been able to find a single character, other than that of pubescence, that will distinguish the two varieties.

This species is of local occurrence on the Queen Charlotte Islands and is represented by a single collection of the pubescent-leaved phase, var. *americana.* A small colony was found along the upper limits of a sand beach near the west end of Mosquito Lake associated with such species as *Calamagrostis canadensis* (Michx.) Beauv., *Carex physocarpa* Presl, *Carex viridula* Michx., and *Juncus falcatus* E. Meyer.

90. Danthonia intermedia Vasey, Bull. Torrey Club 10: 52. 1883.

GRAHAM ISLAND: Newton Pt., *CST22961;* Yakoun Lake, *CT36753.*

MORESBY ISLAND: Bigsby Inlet, *CST22150;* Echo Harbour, *CST22362;* Mosquito Mtn., *CT23692, CT36439;* Upper Victoria Lake, *CT35784;* Mt. Russ, *CT36172;* Sunday Inlet, *CT36598;* Mike Inlet, *CT36665.*

Danthonia intermedia was only reported from a single locality by Hultén (1942, p. 187) in his *Flora of Alaska and Yukon,* however we have collected this species in the coastal belt of the Gulf of Alaska (Moose Pass and 60°37′N 149°33′W, Kenai Peninsula, *Calder 6380 & 6814*), far north of its main range. We have also seen an Alaskan collection from Hatcher Pass (*Dutilly et al. 22012*) and Porsild (1951, p. 87) has reported this species from a number of stations on the Canol Road in Yukon.

This species is common on rocky slopes and knolls on open-wooded slopes from near sea level to about 2,500 ft in the Queen Charlotte Ranges. It is also occasionally found on the sand and gravel shorelines of lakes, for example, Upper Victoria and Yakoun. This species is common at most of the stations cited and probably also occurs throughout the mountain ranges of Graham and Moresby islands.

Deschampsia

Panicles narrow, branches appressed; lemmas 2 mm, callus hairs 1.5 mm, and awns 4.5-5 mm long	*D. elongata*
Panicles open and spreading, branches not appressed; lemmas 4 mm, callus hairs 1-1.5 mm, and awns 5.5-6 mm long	*D. caespitosa*

91. Deschampsia caespitosa (L.) Beauv. ssp. **beringensis** (Hult.) Lawr., Amer. J. Bot. 32: 302. 1945.

D. beringensis Hult., Fl. Kamtch. 1: 107. 1927.

D. caespitosa var. *arctica sensu* Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 16. 1921.

GRAHAM ISLAND: Kumdis Creek Delta, *CST22108;* Lepas Bay, *CST22618;* Tow Hill, *CST22678;* Dawson Inlet, *CST22849, CTS35140;* between Ells and Mercer pts., *CST22908;* Newton Pt., *CST22960;* Shields Bay, *CT23277, CT23306;* Long Inlet, *CT36004;* Naden Harbour, *CT36838;* Blackwater Creek, *CT35055, S3536;* Yakoun Lake, Aug. 1895, *Newcombe* (V); Skidegate, July 18 and 28, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: Alliford Bay, *CST21863;* head of Cumshewa Inlet, *CST21993;* Bigsby Inlet, *CST22139;* Bag Harbour, *CST22182A;* Mt. de la Touche, *CT23605;* Mosquito Mtn., *CT23745, CT23757;* Gray Bay, *CT35248;* Upper Victoria Lake, *CT35733;* Mt. Russ, *CT36188;* Kootenay Inlet, *CT36206;* Takakia Lake, *CT36295;* Mt. Moresby, *CT36438;* Sunday Inlet, *CT36590;* Yakulanas Bay, *CT36645;* Mike Inlet, *CT36660;* Rose Inlet, *CT36990.*

The taxonomic relationships of the entities in the North American *D. caespitosa* complex have been discussed by Lawrence (1945). We are in agreement with his conservative treatment for the Pacific Northwest and follow his designation of the large-flowered coastal entity as *D. caespitosa* ssp. *beringensis*. In 1963 Kawano discussed the evolution and cytogeography of the complex and recognized ssp. *beringensis* as a distinct species extending along the North American Pacific coast to the Aleutian Islands and to Kamchatka in Asia. It is unfortunate that he did not provide a key. In contrast, Lawrence (*op. cit.*) has provided a key, distribution map, descriptions of each subspecies, and a discussion including chromosome studies of each subspecies in the complex.

Deschampsia caespitosa ssp. *beringensis* is one of the most common and conspicuous coastal species on the Queen Charlotte Islands. It was noted in every saline meadow we surveyed as well as in the high-tide zone on shingle beaches in protected bays. At such sites it is flooded during each high tide. In addition to these lowland collections it was noted a number of times in subalpine or alpine habitats.

92. Deschampsia elongata (Hook.) Munro ex Benth., Pl. Hartw. 342. 1857.
Aira elongata Hook., Fl. Bor.-Am. 2: 243. 1840.

GRAHAM ISLAND: 6 mi S of Masset, *CST22811;* 2½ mi S of Tlell, *CST23404, CT35946;* 2 mi E of Queen Charlotte City, *CTS34785;* Yakoun River 4½ mi S of Port Clements, *CTS35033;* Mamin River Delta, *CT35551, T121;* Torrens Island, *CT35827;* Mayer Lake, *CT36109.*

MORESBY ISLAND: islet off Bolkus Islands, *CST22242A;* between Harriet Harbour and Huston Inlet, *CST22247;* Limestone Island, *CST22401, CTS34825;* Gray Bay, *CT35249B, CT35255;* Horn Rock, *CT36521,* Aug. 8, 1957, *Mills.*

Deschampsia elongata is a Cordilleran species of western North and South America. It is a common coastal species of open mesic habitats and is tolerant of a limited amount of salt spray.

On the Queen Charlotte Islands it is a lowland species that is widely distributed along the east coasts of Graham and Moresby islands. Other records are from Masset Inlet and the adjoining drainage systems, and from Horn Rock in Tasu Sound on the west coast of Moresby Island.

Elymus

Plants robust, strongly rhizomatous; leaves coarse-veined	*E. mollis*
Plants slender, tufted or sometimes with short slender rhizomes; leaves fine-veined	
Lemmas glabrous to scabrid on or near the margins	*E. glaucus*
Lemmas sparsely to densely short- to long-hirsute on or near the margins	*E. hirsutus*

93. Elymus glaucus Buckl., Proc. Acad. Phila. 1862: 99. 1862.

Lemmas conspicuously awned ..... ssp. *glaucus*
Lemmas essentially awnless ..... ssp. *virescens*

93a. Elymus glaucus Buckl. ssp. **glaucus.**

GRAHAM ISLAND: Torrens Island, *CT35823.*

MORESBY ISLAND: Alliford Bay, *CT36020.*

93b. Elymus glaucus Buckl. ssp. **virescens** (Piper) Gould, Madroño 9: 126. 1947.
E. virescens Piper, Erythea 7: 101. 1899; *E. glaucus* var. *virescens* (Piper) Bowden, Can. J. Bot. 42: 560. 1964.

GRAHAM ISLAND: Torrens Island, *CST22435, CT35823, CT35824;* Jewell Island, *CST22457;* islet off Lina Island, *CST22915;* Tlell, *CT35436, CT35918;* small island at Skidegate, July 19, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: Hotspring Island, *CST22273;* Sandspit, *CT36021*; Mt. Moresby, *CT36414, CT36419.*

Elymus glaucus, a North American species, consists of two or possibly three infraspecific taxa (Bowden, 1964), two of which occur along the British Columbia – Alaska coast. The wide-ranging typical subspecies, characterized by awned glumes, extends from the Pacific to Atlantic coasts and as far south as Texas and California. The essentially awnless ssp. *virescens* occurs mainly in the coastal region from California to Alaska, but occasionally extends a short distance inland.

On the Queen Charlotte Islands, the unawned ssp. *virescens* is much more common than ssp. *glaucus*. The latter entity is only found at the eastern end of Skidegate Inlet. Only at one station did the two subspecies grow together, Torrens Island (*CT35823* and *CT35824*). This large colony contained a greater proportion of unawned to awned plants. A few plants were found that had short awns and these should probably be considered as intermediates. The two subspecies are essentially coastal on the Islands, but two collections of ssp. *virescens* were made along the grassy margins of a north-facing runnel of Mount Moresby at about 900 ft.

94. Elymus hirsutus Presl, Rel. Haenk. 1: 264. 1830.

GRAHAM ISLAND: Skidegate Village, *CST21422;* Queen Charlotte City, *CST21541;* McClinton Bay, *CST21644;* Langara Island, *CST22556;* Tow Hill, *CST22692;* Shields Bay, *CT23337;* mouth of Honna River, *CT35408;* near junction of Yakoun River and Ghost Creek, *CT35506;* Mamin River Delta, *CT35553, T122, S3506;* Long Inlet, *CT36002;* Kumdis Creek Delta, *CT36121;* Yakoun Lake, *CT36771;* Naden Harbour, *CT36850.*

MORESBY ISLAND: Copper Bay, *CST21904;* Takakia Lake, *CST23111;* Mt. de la Touche, *CT23601;* mouth of Deena River, *CT23774* (DAOM); between Cumshewa and Peel inlets, *CT35196.*

95. Elymus hirsutus Presl × **Hordeum brachyantherum** Nevski.

GRAHAM ISLAND: Kumdis Creek Delta, *CST22114.*

MORESBY ISLAND: head of Cumshewa Inlet, *CST21983, CT36491, CT36493.*

Elymus hirsutus ranges from California northward along the Pacific coast to the northern part of the Alaska panhandle and then sporadically westward to Attu Island in the Aleutian Chain. It is strictly a coastal species in the northern part of its range, but in British Columbia extends inland as far east as the Cariboo, Columbia, and Purcell mountains south of 53°N.

On the Queen Charlotte Islands *E. hirsutus* occurs in both lowland and alpine habitats. It is commonly found along the upper margins of beaches, along stream banks in open coniferous and alder woods, and in grassy runnels near treeline.

In coastal habitats, this species occasionally hybridizes with *Hordeum brachyantherum* Nevski and the resultant hybrid has been designated as × *Elymordeum schaakianum* by Bowden (1958, p. 105).

96. Elymus mollis Trin. in Sprengel, Neue Entdeck. 2: 72. 1821.
E. mollis var. *villosus* E. Meyer, Pl. Labradoricis 20. 1830.
E. arenarius ssp. *mollis* (Trin.) Hult., Fl. Kamtch. 1: 153. 1927.

GRAHAM ISLAND: Yakan Pt., *CST21311* (DAOM); near Lawnhill, *CST21735;* Langara Island, *CST22574;* near mouth of Sangan River, *CST22771;* Masset Spit, *CST22776* (DAOM); Dawson Inlet, *CTS35145;* about 4 mi N of mouth of Oeanda River, *CT35851;* Skidegate, June 1897, *Newcombe* (V).

MORESBY ISLAND: 2½ mi SW of Sandspit, *CST21085;* Chaatl Narrows, *CST21784;* Copper Bay, *CST21876;* head of Cumshewa Inlet, *CST21984;* East Copper Island, *CST22209;* Hotspring Island, *CST22275;* mouth of Deena River, *CT23771* (DAOM); South Low Island, *CT34851;* Gray Bay, *CT35236;* Kaisun, *CT36546.*

Elymus mollis is a wide-ranging coastal species that occurs along the northern rim of the Pacific and also along the coasts of eastern North America, Greenland, and Iceland. It is usually the most conspicuous element of upper beach vegetation, where it often forms extensive colonies especially on sand and shingle beaches. This species frequently hybridizes with *E. glaucus* Buckl. and *E. hirsutus* Presl (Bowden, 1964). Several infraspecific taxa are recognized for *E. mollis,* but all collections from the Queen Charlotte Islands belong to the typical phase, which was based on a Langsdorff collection from Unalaska.

Elymus mollis is a common element of most coastal beaches throughout the Islands and occasionally is found on rocky exposures along the more precipitous coast. This species, as well as *Poa douglasii* ssp. *macrantha* (Vasey) Keck, *Carex macrocephala* Willd., and *Juncus leseurii* Boland., is an excellent sand binder. In addition to the records cited, there is an 1878 Dawson collection in the National Museum at Ottawa from the west coast of the Islands, but no specific data are given.

Festuca

Plant annual
- Lemmas ciliate towards the apex ..... *F. megalura*
- Lemmas not ciliate
  - First glume about 1-2.5 mm long, second glume about 4-4.5 mm long ..... *F. myuros*
  - First glume about 3.5-4.5 mm long, second glume about 6-7.5 mm long ..... *F. dertonensis*

Plants perennial
- Lemmas awned
  - Leaf blades flat, the largest more than 4 mm wide .. *F. subulata*
  - Leaf blades involute, the largest less than 4 mm wide
    - Plants loosely caespitose with short-creeping rootstocks; culms usually decumbent and geniculate at base with conspicuous fibrillose leaf sheaths ..... *F. rubra*
    - Plants in compact caespitose clumps; culms erect, rarely geniculate, the leaf sheaths never conspicuously fibrillose ..... *F. occidentalis*
- Lemmas awnless
  - Florets proliferous ..... *F. prolifera*
  - Florets not proliferous
    - Basal sheaths thin, brownish, conspicuously fibrillose; auricles not ciliate ..... *F. elatior*
    - Basal sheaths thickish, whitish, not fibrillose; auricles minutely ciliate ..... *F. arundinacea*

97. ***Festuca arundinacea** Schreb., Spic. Fl. Lips. 57. 1771.
F. elatior var. *arundinacea* (Schreb.) Wimm., Fl. Schles. ed. 3. 59. 1857.

GRAHAM ISLAND: near mouth of Kliki Creek, *CT36821*.

Most North American authors do not recognize *F. arundinacea* as specifically distinct from *F. elatior* L., but as Dore (1959, p. 17) has pointed out, the former is hexaploid and can readily be distinguished morphologically from the diploid *F. elatior*. Hultén (1942, p. 241) reports *F. arundinacea* from a number of localities in Alaska. Possibly some of the records should be re-

ferred to *F. elatior* as this is the most commonly introduced perennial fescue in the north.

This species is apparently a rare introduction on the Charlottes. It was found only on Graham Island, where one small colony was located in disturbed sandy soil near Kliki Creek on the north shore road from Masset to Tow Hill.

98. ***Festuca dertonensis** (All.) Asch. & Graebn., Syn. Mitteleur. Fl. 2: 588. 1901.

GRAHAM ISLAND: between Queen Charlotte City and Skidegate Village, *CST20923;* Image Pt., *CTS34673, CT35394;* Mamin River Delta, *CT35542;* between Skidegate and Skidegate Village, *CT35836;* Mayer Lake, *CT36110.*

MORESBY ISLAND: Sandspit, *CT21101;* Hotspring Island, *CST-22307A, CST22309B;* Skidegate Lake, *CT35286.*

The three weedy annual fescues that occur on the Queen Charlotte Islands would be considered by most European authors to belong to the genus *Vulpia* based on sect. *Vulpia* (C.C. Gmel.) Reichenb. of *Festuca.* After surveying the North American annual species we are not convinced that the annual fescues should be treated as a separate genus. There are many records of this species from Vancouver Island and the adjacent mainland. Its northern limit along the Pacific coast is apparently the Queen Charlotte Islands and Prince Rupert on the mainland.

Festuca dertonensis, a European adventive, is the only common annual fescue on the Charlottes. It is a species of disturbed habitats and open ground that was noted in many places on bluffs bordering Skidegate Inlet, in waste places in the vicinity of Sandspit, and in other relatively dry open habitats in the eastern sections of Graham and Moresby islands.

99. ***Festuca elatior** L., Sp. Pl. 1: 75. 1753.

GRAHAM ISLAND: near Tow Hill, *CST22662.*

MORESBY ISLAND: Copper Bay, *CT36080;* near Alliford Bay, *CT36262.*

Festuca elatior, an introduced Eurasian species of meadows and waste places, is of sporadic occurrence in British Columbia both at the coast and in the interior. The collection from near Tow Hill is from a grassy swale in a locality that is uninhabited at the present time, although in the early 1900's a number of families had homesteads in the general area. Many adventives have been found along this stretch of the coast. At Copper Bay it is common in sandy clearings at a camp site, and a few large colonies were found in disturbed soil along the roadside about a mile northeast of Alliford Bay.

100. Festuca megalura Nutt., J. Acad. Phila. II. 1: 188. 1848.

MORESBY ISLAND: Hotspring Island, *CST22309A*.

Festuca megalura, a native annual, is found throughout most of western North America and occurs sporadically in the east. It is probably indigenous to the drier coastal habitats of Vancouver Island and the adjacent mainland of southern British Columbia, but is a species that is easily introduced and spreads rapidly once established. It is the only annual fescue reported for Alaska (Anderson, 1959, p. 86).

On the Queen Charlotte Islands, *F. megalura* was noted only at Hotspring Island, where it was growing with *F. dertonensis* (All.) Asch. & Graebn. around the hot-spring pools.

101. *Festuca myuros L., Sp. Pl. 1: 74. 1753.

MORESBY ISLAND: Mosquito Lake, *CT36711*.

This Eurasian and African annual is represented on the Charlottes by a single collection from the west end of Mosquito Lake. It was growing with *Agrostis exarata* Trin., *Festuca subulata* Trin., and a number of adventives along a trail in a logged-over area back from the shoreline.

102. Festuca occidentalis Hook., Fl. Bor.-Amer. 2: 249. 1840.

GRAHAM ISLAND: near Skidegate Village, *CST21717;* Tlell, *CST21809;* about 3 mi NW of Tlell, *CST22077;* Blackwater Creek, *T52, CTS35062;* Marie Lake, *T86;* near Yakoun River 4½ mi S of Port Clements, *CTS35039;* 6 mi S of Juskatla, *CT35490;* 4 mi S of Tlell, *CT35949*.

MORESBY ISLAND: near Alliford Bay, *CST21831;* Gray Bay, *CT35240, CT35251*.

This species is one of the most widely distributed fescues of southern and central British Columbia both at the coast and in the interior. On the Charlottes it is restricted to the lowlands of eastern Graham and Moresby islands, where it is found in and along the margins of open coniferous forests usually in light well-drained sandy or gravelly soils. It is readily distinguished from the strictly coastal *F. rubra* L. by a tightly clumped caespitose habit and lemmas that have awns as long as or longer than the body of the lemma. Both species may have glabrous, scabrous, or pubescent glumes and lemmas, and glabrous or scabrous peduncles and pedicels. There is a strong tendency, however, for the panicle branches and floral parts to be more pubescent or scabrous in *F. rubra.* The only other lowland native perennial *Festuca* on the Islands is *F. subulata* Trin., which is a broad-leaved, open-panicled species with flexuous, drooping branches.

The collections of *F. occidentalis* cited represent the northern limit of its range at the coast, however we have seen collections from farther north on the

mainland from the Smithers area and Skeena Crossing in the Coast Mountains and from near the Parsnip River at the same latitude in the Rocky Mountains.

103. Festuca prolifera (Piper) Fernald, Rhodora 35: 133. 1933.
F. rubra var. *prolifera* Piper, Contr. U.S. Nat. Herb. 10: 21. 1906.

MORESBY ISLAND: Mt. de la Touche, *CT23581;* Mt. Moresby, *CT36418.*

The plants we are referring to this species are loosely caespitose, the culms are decumbent and geniculate at the base, and the sheaths are conspicuously fibrillose. In these characters *F. prolifera* is similar to the lowland *F. rubra* L. of the Queen Charlotte Islands, but, as pointed out by Fernald, the lemmas of *F. prolifera* are awnless and there are other minor morphological differences between these two species. *Festuca prolifera* is quite distinct from *F. vivipara* (L.) Sm., the latter having affinities with *F. ovina* L. and related species.

The collections cited are the only alpine records of a *Festuca* from the Islands. A small colony was found on the east slope of Mount de la Touche on a steep talus slope below cliffs at about 2,000 ft, and a few plants were found in a steep, north-facing rocky runnel between 1,000 and 1,300 ft below the north face of Mount Moresby.

104. Festuca rubra L., Sp. Pl. 1: 74. 1753.

GRAHAM ISLAND: near Skidegate Village, *CST21719;* Tlell, *CST-22099, CTS34640;* Kumdis Creek, *CST22109;* Langara Island, *CST22533, CST22575;* Lepas Bay, *CST22626;* Masset Spit, *CST22650, CTS34729;* Dawson Inlet, *CST22930A, CTS35138;* Lina Island, *CST22939;* Queen Charlotte City, *CST23029* (DAOM), *CT36940;* near Lawn Pt., *CST23272* (DAOM); 2½ mi SE of Port Clements, *CTS34598;* Image Pt., *CTS34674;* Mamin River near Juskatla, *CT35550;* Torrens Island, *CT35822;* about 4 mi N of mouth of Oeanda River, *CT35867;* Naden Harbour, *CT36875;* near Claudet Island, June, 1961, *Foster & Bigg* (UBC); near Skidegate, July 19, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: Chaatl Narrows, *CST21743;* Sandspit, *CST-21816, CT36017;* head of Cumshewa Inlet, *CST21980, CT36249;* Bag Harbour, *CST22183;* East Copper Island, *CST22210, CST22256, CST22264;* islet off Bolkus Islands, *CST22239;* Hotspring Island, *CST22311;* Skedans Islands, *CST22395;* Limestone Island, *CST22423,* May 5, 1923, *Newcombe* (V); South Low Island, *CTS34844;* Gray Bay, *CT35253;* Kootenay Inlet, *CT36205;* Kaisun, *CT36556,* July 1897, *Newcombe* (V); Yakulanas Bay, *CT36652.*

Festuca rubra, a polymorphic complex widely distributed throughout the Northern Hemisphere, is comprised of a host of closely related species with a number of infraspecific segregates. As there is no comprehensive treatment of this complex on a worldwide basis, we prefer to regard all collections from the

British Columbia – Alaska coast as *F. rubra* in the broad sense. We are quite aware that the indigenous and introduced plants of the Pacific coast belong to distinct races, but we do not believe it is practical at the present time to assign the population from the Queen Charlotte Islands to any one of the described entities. Hultén's (1962, p. 64, Maps 57A and B) brief synopsis of this species in the first volume of *The Circumpolar Plants* includes the following entities from western North America: ssp. *aucta* (Kretcz. & Bobr.) Hult., a race extending from the northern part of the Alaska panhandle through the Aleutian chain to eastern Siberia; ssp. *cryophila* (=*F. richardsonii* Hook., in part), a circumpolar race that extends from the Bering Sea through the Yukon and interior British Columbia to California; and a lowland population restricted to the Pacific coast, which includes both native and introduced types. We have seen many coastal Alaskan collections from the panhandle to Attu Island in the Aleutians, which have been determined as *F. rubra* in the broad sense or as one of its varieties. Included are collections identified by A. S. Hitchcock, Agnes Chase, J. Swallen, and others as var. *kitaibeliana* (Schult.) Piper, var. *barbata* (Schrank) Hack., var. *lanuginosa* Mert. & Koch., var. *subvillosa* Mert. & Koch, and ssp. *richardsonii* (Hook.) Hult. Henry (1915, p. 47), in his flora of British Columbia, recognized five varieties: *genuina* (=*rubra*), *kitaibeliana, longiseta* Hack., *megastachys* Gaud., and *pruinosa* Hack. In other west coast floras still further segregates are reported. Hackel (1882) recognized over 30 entities in the *F. rubra* complex, whereas Saint-Yves (1925), in a treatment of *Festuca* subgen. *Eu-festuca,* recognized 14 taxa in this same complex from North America.

On the Queen Charlotte Islands, *F. rubra* is a coastal species found on grassy benches along the upper margins of sand and shingle beaches and in sedge meadows. On rocky coastlines it occurs in cliff crevices and on bluffs. All collections but two are from native habitats and there is no evidence that this species has been introduced into the Islands. The population from the Islands is extremely variable but can be characterized as follows: plants green or glaucous, loosely caespitose with short-creeping rootstocks; culms 15 to 80 cm tall, usually decumbent or geniculate at the base but sometimes strictly erect; lower sheaths brownish and conspicuously fibrillose; leaf blades glabrous, usually involute; panicle 4 to 12 cm long, usually narrow and contracted with erect, ascending or occasionally with conspicuously divaricate branches; spikelets 4- to 8-flowered; glumes glabrous or scabrous towards the apex, usually purplish-tinged, rarely green; lemmas glabrous or scabrous especially towards the apex or rarely densely pubescent all over, usually purplish-tinged, rarely green, the awn usually less than half as long as the body but occasionally as long as or longer than the body. Plants from exposed rocky habitats on small islands off the east coast of Moresby Island are sometimes dwarf and not typical of the Island's population.

Carter and Newcombe (1921, p. 17) reported *F. ovina* from the *Charlottes* but, although we have not seen the Dawson collection on which this report is based, we assume that the collection should be referred to *F. rubra* or *F. occidentalis* Hook.

105. Festuca subulata Trin. in Bong., Mém. Acad. St. Pétersb. VI: 2. 173. 1832.

GRAHAM ISLAND: Tow Hill, *CST22672A;* Dawson Inlet, *CST22846;* Honna River, *CT35402;* 6 mi S of Juskatla, *CT35488;* near junction of Yakoun River and Ghost Creek, *CT35509;* Yakoun Lake, *CT36772;* Naden Harbour, *CT36843;* Skidegate, July 18, 1910, *Spreadborough* (CAN); Dawson Harbour, July 24, 1897, *Newcombe* (CAN).

MORESBY ISLAND: Hotspring Island, *CST22292;* Echo Harbour, *CST22331;* Mt. de la Touche, *CT23610;* mouth of Deena River, *CT23773* (DAOM); Skidegate Lake, *CT36075;* Mt. Moresby, *CT36416;* Kaisun, *CT-36545;* Sunday Inlet, *CT36627.*

Koyama and Kawano (1964, p. 875) have recently discussed the relationship of the Asiatic *F. extremiorientalis* Ohwi to the North American *F. subulata* and have come to the same conclusion as Hackel, who, in 1899, considered them conspecific, but distinct at varietal rank. We are following these authors in treating the Old and New World populations as distinct races, even though some of the distinguishing diagnostic characters enumerated by Koyama and Kawano are not reliable, for example, the callus is not depressed in ssp. *subulata,* but is stiffly erect and elongate as in ssp. *japonica* (Hackel) Koyama & Kawano, and the keels and awns of the lemmas of the North American ssp. *subulata* may be as scabrous as in the Asiatic plant. We are not in a position to compare the two populations as we have seen only two collections of ssp. *japonica,* but ssp. *subulata* appears to differ from the Asiatic plant in having narrower glumes and lemmas that lack a conspicuous nerve or nerves between the midvein and margin.

Festuca subulata is well represented in our collections from the Queen Charlotte Islands. Most of the records are from lowland forest habitats of the Queen Charlotte Ranges and its eastern flanks, but there are isolated stations at Tow Hill in northeastern Graham Island and on Hotspring Island off the east coast of Moresby Island. This species is essentially an element of the mesic lowland forest, where it occurs on river banks, in shaded rocky runnels, and in open-wooded meadows. At times it forms conspicuous colonies, especially on river flats, and is often associated with other grasses such as *Melica subulata* (Griseb.) Scribn., *Elymus hirsutus* Presl, and *Poa laxiflora* Buckl.

Glyceria

106. Glyceria occidentalis (Piper) J. C. Nels., Torreya 19: 224. 1919.

GRAHAM ISLAND: Yakoun River Delta, *CT35469;* 4 mi SW of Port Clements, *CT35562;* Tlell, *CT35930;* Yakoun Lake, *CT36789.*

This *Glyceria,* a tetraploid (Church, 1949, p. 157) belonging to the sect. *Euglyceria* Griseb., is found along the Pacific coast from northern California

to British Columbia. On the Queen Charlotte Islands it usually occurs on sandy or silty margins of creeks or lakes. The collection from Yakoun Lake was made on the shallowly inundated sandy shore along the east side of the lake near the mouth of Baddeck Creek. The specimens from the Charlottes represent the northernmost stations for this species along the Pacific coast.

Hierochloë

107. Hierochloë odorata (L.) Beauv., Ess. Agrost. 62. 1812.

GRAHAM ISLAND: Lepas Bay, *CST22622B;* Juskatla, *S3523;* Tlell, *CT35929.*

Hierochloë odorata, a circumboreal species, is widely distributed throughout the Cordilleran region of western North America. On the Queen Charlotte Islands it was found at the coast behind the driftwood zone at two localities and in a sedge swale on a wet sandy beach near Juskatla in Masset Inlet. Although this species is not widely distributed on the Islands it is common at each of the three stations.

Holcus

108. *Holcus lanatus L. Sp. Pl. 2: 1048. 1753.

GRAHAM ISLAND: between Queen Charlotte City and Skidegate Village, *CST21715, CST21721, CT35842;* Tlell, *CST22101, CT35923;* Tow Hill, *CST22685;* Image Pt., *CTS34678;* Delkatla Inlet, *CT35589;* near mouth of Oeanda River, *CT35898.*

MORESBY ISLAND: Sandspit, *CST21820;* head of Cumshewa Inlet, *CST21982;* Hotspring Island, *CST22307;* mouth of Deena River, *CT23795.*

Holcus lanatus, a native of Europe, has been widely introduced into North America. It is particularly common on the Pacific coast and often forms large colonies in disturbed roadside habitats and in logged-over areas.

On the Queen Charlotte Islands, *H. lanatus* is one of the most common of the introduced grasses. It is especially abundant on open grassy benches and bluffs near the coast and is widely distributed throughout the inland logged-over forested regions. It is a conspicuous element of the vegetation on the extensive Skidegate Lake burn.

Hordeum

109. Hordeum brachyantherum Nevski, Act Inst. Bot. Acad. Sci. U.R.P.S.S. I. 2: 61. 1936.

H. jubatum ssp. *breviaristatum* Bowden, Can. J. Bot. 40: 1960. 1962.

GRAHAM ISLAND: near Skidegate Village, *CST21720;* Lepas Bay, *CST22628;* Masset Spit, *CST22649;* Tow Hill, *CST22695;* Dawson Inlet, *CST22839;* Haida Pt., *CT35397;* Mamin River Delta, *CT35547;* Long Inlet, *CT36005;* Kumdis Creek Delta, *CT36120;* Naden Harbour, *CT36861, CT36862, CT36871;* Skidegate, July 25, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: Copper Bay, *CST21902;* head of Cumshewa Inlet, *CST21983;* East Copper Island, *CST22218;* islet off Bolkus Islands, *CST-22236;* Echo Harbour, *CST22312;* Limestone Island, *CST22413;* Kootenay Inlet, *CT36231;* Kaisin, *CT36525;* Yakulanas Bay, *CT36650;* Rose Inlet, *CT36986.*

Bowden (1962) in a cytotaxonomic treatment of *Hordeum* in Canada has followed other authors in recognizing three entities, but he treats them as a single species *H. jubatum,* with three subspecies: *jubatum,* × *intermedium* Bowden (=*H. caespitosum* Scribn.), and *breviaristatum* (=*brachyantherum*). In our experience the three taxa in British Columbia, Alaska, and the Yukon almost always either have essentially distinct ranges or are separated ecologically or altitudinally. Mitchell and Wilton (1964, p. 269-280) in a recent study of Alaskan material have found similar relationships. For these reasons, although the morphological characters that separate these taxa are weak, and there are no barriers to hybridization, we prefer to recognize the short-awned plant of the Queen Charlotte Islands as a separate species, *H. brachyantherum.* This species is essentially a coastal one, whereas the other two taxa have mainly an inland range.

Hordeum brachyantherum, a lowland species on the Queen Charlotte Islands, is restricted to saline meadows, cliffs, rocky bluffs, and sand or shingle beaches at the coast. A single small colony of long-awned plants (up to 3.7 cm) was noted in a large population of short-awned (up to 1.0 cm) plants growing in the extensive saline tidal meadows near the mouth of Lignite Creek at Naden Harbour. In our opinion this isolated colony of long-awned plants cannot be considered as part of typical *H. jubatum* because the awns of the latter species are usually well over 4.5 cm long. They could be referred to *H. caespitosum* but we believe that the presence of a small colony of long-awned plants in such an extensive short-awned population is best considered as a mutation producing a single phenotypic change in awn length.

Lolium

110. *Lolium perenne L., Sp. Pl. 1: 83. 1753.

GRAHAM ISLAND: Tlell, *CST22096, CTS34653;* Mamin River Delta, *CT35558.*

MORESBY ISLAND: Sandspit, *CST21868, CT35341, CT36015;* Gray Bay, *CT35252.*

According to Hitchcock (1935, p. 269) *L. perenne,* perennial ryegrass, was the first grass to be cultivated in Europe. It has been widely introduced throughout North America and is frequently a constituent of cheaper lawn grass seed mixtures. Many phenotypes are found within the species and many are undoubtedly related to the varying habitats into which *L. perenne* has been introduced. The plants from the Queen Charlotte Islands are perennial and awnless and are referred to the typical subspecies.

On the Islands, *L. perenne* is common in the Sandspit and Tlell regions. At Sandspit it is used as the main stabilizing grass for the sandy area surrounding the airstrip and has been introduced by the local farmers as a forage and pasture crop.

Melica

111. Melica subulata (Griseb.) Scribn., Proc. Acad. Phila. 1885: 47. 1885.

GRAHAM ISLAND: Jungle Beach, *CST21395;* near Skidegate Village, *CST21436;* Empire Anchorage, *CS21507;* McClinton Bay, *CST21643;* Dawson Inlet, *CST22845, CTS35110;* Blackwater Creek, *T56;* Honna River, *CTS34805;* 6 mi S of Juskatla, *CT35492.*

MORESBY ISLAND: Bigsby Inlet, *CTS34905;* Anna Inlet, *CTS34959;* Crescent Inlet, *CTS34998;* between Cumshewa and Peel inlets, *CT35205;* Sandspit, *CT35338;* Kootenay Inlet, *CT36229;* Kaisun, *CT36542;* Sunday Inlet, *CT36628.*

Melica subulata is common in mesic forest habitats on Vancouver Island and the adjacent mainland, but there are no coastal records from mainland British Columbia north of Vancouver Island. In the interior it is known only from a few collections in the southern part of the province. It is apparently of local occurrence in the northern part of its range because Hultén reported only two stations for Alaska: Unalaska Island, and Howkan on Long Island in the panhandle.

This species was collected and noted many times in the lowlands of the Queen Charlotte Islands in partially open hemlock-spruce forest, especially along creek and river banks. It often forms conspicuous colonies on alluvial flats and at times is one of the dominant grasses of such a habitat. Under densely shaded conditions it rarely flowers. There are also a number of records from open-forested coastal habitats.

Phalaris

112. *Phalaris arundinacea L., Sp. Pl. 1: 55. 1753.

MORESBY ISLAND: Sandspit, *CT37014.*

Phalaris arundinacea, a widely introduced Eurasian species, is frequently

grown as a forage plant in the coastal and interior regions of British Columbia. It is characterized by stout rhizomes and coarse-leaved stems. This species was only noted at W. Mather's farm near the Sandspit post office. It was apparently introduced many years ago with imported hay, but it has not become an aggressive weed.

PHLEUM

Culms not swollen or bulblike at the base; upper leaf sheaths inflated; panicles usually short cylindrical ..... *P. alpinum*
Culms swollen or bulblike at base; leaf sheaths not inflated; panicles usually long cylindrical ..... *P. pratense*

113. Phleum alpinum L., Sp. Pl. 1: 59. 1753.

GRAHAM ISLAND: Shields Bay, *CT23376.*

MORESBY ISLAND: Takakia Lake, *CST23145, CT36319;* Mt. de la Touche, *CT23611;* Mosquito Mtn., *CT23736;* between Cumshewa and Peel inlets, *CT35195;* Mt. Moresby, *CT36434.*

Hultén (1942, p. 136) treats plants of this species from Kamchatka and western North America as a distinct race, var. *americanum* Fournier. He states that they differ from the typical phase in their higher growth, more strongly inflated upper sheaths, and shorter awns of the glumes. From a cursory examination of a large body of material from both North America and Europe it does not seem that this segregation is warranted.

Phleum alpinum was found in most of the alpine areas surveyed in the Queen Charlotte Islands. It occurs in meadows and on heathy slopes near tree line and extends down almost to sea level in forest openings and on exposed bluffs especially on the west coast. In addition to the collections cited it was noted near Jalun Lake and on Mount Russ above Kootenay Inlet.

114. *Phleum pratense L., Sp. Pl. 1: 59. 1753.

GRAHAM ISLAND: Queen Charlotte City, *CST23016;* Tlell, *CST-23157, CT35935;* Image Pt., *CT35385;* Mayer Lake, *CT36107.*

Phleum pratense was found on grassy coastal bluffs at Skidegate, among scrub Sitka spruce near the shoreline at Queen Charlotte City, and in disturbed ground by a building at the south end of Mayer Lake. It was also noted a number of times in pastureland near the Richardson Ranch at Tlell, where it was obviously introduced as a source of feed. This species is widely introduced along the Pacific coast and probably occurs in and around all settlements on the Charlottes.

Poa

Plants with short or elongate rhizomes
- Plants dioecious; coastal species of sand dunes and bluffs
  - Panicles 1.5-4 cm long; lemmas scaberulous, about 2.5-3.5 mm long ..... *P. confinis*
  - Panicles 5-13 cm long; lemmas villous below especially on keel, about 8-11 mm long ..... *P. douglasii*
- Plants not dioecious; florets perfect
  - Lower panicle branches drooping, flexuous; culms and sheaths retrorsely scabrous ..... *P. laxiflora*
  - Lower panicle branches never conspicuously drooping or flexuous; culms and sheaths glabrous ..... *P. pratensis*

Plants tufted and without rhizomes
- Annuals about 6-25 cm high; panicles less than 4 cm long ..... *P. annua*
- Perennials more than 25 cm high; panicles more than 4 cm long
  - Lemmas conspicuously pubescent especially on the keel and marginal nerves ..... *P. stenantha*
  - Lemmas glabrous or weakly pubescent on the keel and marginal nerves
    - Lemmas glabrous, marginal nerves prominent .. *P. trivialis*
    - Lemmas pubescent on the keel and marginal nerves towards the base, marginal nerves not prominent
      - Largest leaves 2-3 mm broad; panicles elongate, narrow, and flexuous; panicle branches elongate, flexuous, and few-flowered; alpine ..... *P. leptocoma*
      - Largest leaves 1-1.5 mm broad; panicles narrowly pyramidal; panicle branches short, ascending and few- to many-flowered; lowland ..... *P. interior*

115. *Poa annua L., Sp. Pl. 1: 68. 1753.

GRAHAM ISLAND: Queen Charlotte City, *CST20918;* Masset Spit, *CST21267;* Mamin River Delta, *T115;* Tow Hill, *CTS34752;* Dawson Harbour, June 1897, *Newcombe* (V).

MORESBY ISLAND: near Alliford Bay, *CST21057;* Sandspit, *CST-21108;* Limestone Island, *CTS34820;* between Cumshewa and Peel inlets, *CT35177.*

Poa annua is a widely introduced and well-established annual in the settled areas of eastern Graham and northeastern Moresby islands. It was collected along roadsides, on gravel-shingle beaches, on the margin of a muddy pond, and in soil-filled cliff niches, and was noted in a number of other open disturbed habitats. This annual *Poa* will not withstand severe competition. It is one of the few species that, together with *Sagina maxima* A. Gray, has become well established in cracks between the wooden planking of old wharves at all settlements on the Charlottes. In such a habitat we found lush plants producing abundant seed.

116. Poa confinis Vasey, U.S. Dept. Agr. Div. Bot. Bull. 13: *pl.* 75. 1893.

GRAHAM ISLAND: Haida Pt., *CST20867;* near Lawnhill, *CST20896A;* mouth of Sangan River, *CST21144;* Masset Spit, *CST21244;* 4½ mi E of Masset, *CST21302;* Yakan Pt., *CST21313;* Tlell, *CST34637;* about 4 mi N of mouth of Oeanda River, *CT35866;* near mouth of Oeanda River, *CT35894.*

MORESBY ISLAND: near Alliford Bay, *CST21050;* Sandspit, *CST-21110;* South Low Island, *CTS34856.*

Poa confinis is common along the upper limits of the sand and gravel beaches that extend from near Skidegate to Masset on the east and north coasts of Graham Island. There are also records from coastal rock bluffs near Alliford Bay and on South Low Island off the east coast of Moresby Island. At Sandspit it is a common element of the upper beach zone. *Poa confinis,* like *P. douglasii* ssp. *macrantha,* has deep-seated long-creeping rhizomes and is another species that helps to control erosion and sand drifting along the exposed beaches of eastern Graham Island. *Poa confinis* is at the northern limit of its range on the Queen Charlotte Islands.

117. Poa douglasii Nees ssp. **macrantha** (Vasey) Keck, Leafl. West. Bot. 10: 118. 1964.
P. macrantha Vasey, Bull. Torrey Club 15: 11. 1888.

GRAHAM ISLAND: Rose Spit, *CST21218;* 10 mi E of Masset, *CST-21304;* Tlell, *CST21807, CST34631,* July 7, 1952, *Pillsbury* (UBC), May 2, 1951, *Cowan* (UBC); near Tow Hill, *CST22690;* mouth of Sangan River, *CST22765, CT35595;* near mouth of Oeanda River, *CT35887;* Masset, May 28, 1951, *Cowan* (UBC).

Poa douglasii ssp. *macrantha,* which is at the northern limit of its range in the Queen Charlotte Islands, extends south to California. The typical phase, which usually has a more compact shorter panicle and shorter spikelets and anthers, is restricted to California.

This species forms large colonies along the upper limits of the extensive sand beaches of northeastern and eastern Graham Island, where it is often one of the dominant elements of the coastal vegetation. It has long-spreading aerial

runners and deep-seated creeping rhizomes, which make it an excellent sand binder. It is associated with such species as *Carex macrocephala* Willd., *Cakile edentula* (Bigel.) Hook., *Glehnia littoralis* ssp. *leiocarpa* (Mathias) Hult., *Lupinus littoralis* Dougl., and *Senecio pseudo-arnica* Less. At Rose Spit it is one of the dominant beach species with *Carex macrocephala* and *Tanacetum huronense* Nutt. *Poa douglasii* is not found on the coarse shingle beaches and rocky shorelines that extend for long stretches along the coastlines of both the Queen Charlotte Islands and Vancouver Island.

118. *Poa interior Rydb., Bull. Torrey Club 32: 604. 1905.

GRAHAM ISLAND: Queen Charlotte City, *CT35914.*

Poa interior is a widely distributed native species east of the Coast Mountains, but as far as we are aware it is only a sporadic introduction along the British Columbia coast. The only record for the Charlottes is from shale outcrops along the shoreline in front of the Haida Hotel at Queen Charlotte City.

119. Poa laxiflora Buckl., Proc. Acad. Phila. 1862: 96. 1862.
P. leptocoma var. *elatior* Scribn. & Merr., Coutr. U.S. Nat. Herb. 13:71. 1910.

GRAHAM ISLAND: McClinton Creek, *CST21677;* Langara Island, *CST22554;* Tow Hill, *CST22671, CST22672B, CST22676, CST22689;* Dawson Inlet, *CST22930A & B;* near junction of Yakoun River and Ghost Creek, *CT35504;* Towustasin Hill, *CT35536;* Naden Harbour, *CT36849.*

MORESBY ISLAND: between Cumshewa and Peel inlets, *CT35193;* Mt. Moresby, *CT35321, CT36413;* Kootenay Inlet, *CT36200;* Kaisun, July 14, 1897, *Newcombe* (CAN).

Hitchcock (1951, p. 114) in his *Manual of the Grasses of the United States* reports only four stations for *P. laxiflora:* Cape Fox and Hot Springs in southeastern Alaska, Sol Duc Hot Springs in the Olympic Mountains of Washington, and Sauvies Island near Portland, Oregon. Hubbard (1955, p. 155) in a list of grasses for British Columbia includes this species, but states there are no records for the province. We have seen the collections of *P. laxiflora* that are in the United States National Museum, Washington, and in addition to the stations reported by Hitchcock there is a J. K. Henry record from Prince Rupert, British Columbia. This collection and the one from Hot Springs, Alaska, are a good match for the series of this species collected from the Queen Charlotte Islands. However, plants of the northern population are not quite typical of *P. laxiflora* as defined by Hitchcock (*op. cit.*) and Hultén (1942, p. 214) in that they differ in usually having broader leaves, larger spikelets with as many as seven flowers in each spikelet, and often longer lemmas. The collections may be briefly characterized as follows: plants about 30 to 120 cm high, weakly to strongly rhizomatous; leaves flat, 3 to 7 mm wide, glabrous or scabrous on the margins and midvein beneath; sheaths weakly

retrorse-hispid; ligules about 2 to 4 mm long; panicles open, up to about 30 cm long with drooping branches in pairs or whorls of three at all but the uppermost nodes; spikelets 2- to 7-flowered; glumes purplish-tinged, glabrous except for scabrous midnerve and occasionally scabrous marginal nerves; lemmas about 4 to 5.5 mm long, webbed at the base, glabrous except for the median and marginal nerves, which are weakly to strongly pubescent at the base; anthers about 1 mm long. In 1961 in a survey of Vancouver Island and the adjacent islands we collected a number of species of *Poa,* but did not find *P. laxiflora.* It would be surprising if this species is not eventually found along the coast between the Charlottes and the state of Washington as we know of no other species with a disjunct distribution pattern of this type.

Poa laxiflora is well represented in our collections from the Charlottes. It is found in and adjacent to the Queen Charlotte Ranges with a disjunct station at Tow Hill on the north coast of Graham Island. In exposed situations at the coast, such as on the vertical basalt cliffs at Tow Hill, plants are high-grown with broad leaves and large spikelets, whereas in shaded forest habitats plants are shorter in stature with narrower leaves and fewer-flowered spikelets. *Poa laxiflora* is essentially a lowland species that occurs mainly in moist and shady habitats along the upper margins of sea beaches and in open-forested meadows along river banks in the interior. It was locally common along the grassy margins of a steep rocky runnel at about 900 ft on the north face of Mount Moresby.

120. Poa leptocoma Trin., Mém. Acad. St. Pétersb. VI. 1: 374. 1830.
P. paucispicula Scribn. & Merr., Contr. U.S. Nat. Herb. 13: 69. *pl.* 15. 1910.

GRAHAM ISLAND: Shields Bay, *CT23368.*

MORESBY ISLAND: Takakia Lake, *CST23120B, CST23151.*

Hultén (1942, p. 215) in a treatment of the grasses in his *Flora of Alaska and Yukon* discussed the relationship of *P. paucispicula* to *P. leptocoma* and came to the conclusion that they should not be considered as two distinct species. We have seen many collections from British Columbia, the Yukon, and Alaska determined under one name or the other and we agree with Hultén that they should all be referred to *P. leptocoma.*

This species occurs in moist rocky runnels and on talus slopes at or near tree line in the Queen Charlotte Ranges. Although poorly represented in our collections it probably occurs in alpine habitats throughout the mountainous regions of the Islands.

121. *Poa pratensis L., Sp. Pl. 1: 67. 1753.

GRAHAM ISLAND: Yakan Pt., *CST21314;* near Skidegate, *CST21406, CST21718,* July 19, 1910, *Spreadborough* (CAN); Tlell, *CST21811, CST-22100, CT35922,* June 2, 1951, *Cowan* (UBC); Langara Island, *CST22563,*

June 1, 1952, *Guiget & Beebe* (V); Masset Spit, *CST22652;* Mamin River Delta, *T126;* 2½ mi SE of Port Clements, *CTS34597;* about 4 mi N of mouth of Oeanda River, *CT35870.*

MORESBY ISLAND: Sandspit, *CST21083, CST21862;* inlet between Harriet Harbour and Huston Inlet, *CST22248;* Gray Bay, *CT35250;* Kaisun, *CT36562.*

We strongly suspect that *P. pratensis* is not native to the Queen Charlotte Islands. It was collected along roadsides, in open meadows and on coastal bluffs adjacent to the road which extends from Queen Charlotte City to Tow Hill, and near abandoned habitations and settlements at Langara Island, Juskatla Logging Camp, Masset Spit, Kaisun, Gray Bay and Sandspit. It was also noted near the mouth of the Oeanda River with other adventives in an extensive meadow that serves as pasture for wild cattle which roam the coastal strip between Tlell and Rose Spit. There is one other record, a disjunct station at the head of a small harbour between Huston Inlet and Harriet Harbour where there was a Japanese shellfish cannery many years ago.

122. Poa stenantha Trin., Mém. Acad. St. Pétersb. VI. 1: 376. 1830.
P. gracillima Vasey, Contr. U.S. Nat. Herb. 1: 272. 1893.

MORESBY ISLAND: Takakia Lake, *CST23150, CT36342;* Mt. de la Touche, *CT23595, CT23596, CT23599;* between Cumshewa and Peel inlets, *CT35191;* Mt. Russ, *CT36140;* Koohoo Hill, *CT36253;* Mt. Moresby, *CT36417.*

We have examined the type (*Herb. Trinii:* Unalaska, Chamisso, LE) and a series of collections on which Trinius based his *P. stenantha.* Hultén (1942, p. 220, 221) has placed *P. gracillima* in the synonymy of *P. stenantha* and on the basis of the Alaska and British Columbia material that we have seen this decision seems reasonable. *Poa stenantha* is apparently a lowland species in the Alaska panhandle and northward along the Alaska coast, whereas on the Queen Charlotte Islands it is essentially an alpine plant that only rarely reaches sea level. The population from the Queen Charlotte Islands is comprised of plants that are densely tufted, are perennial, and have contracted to open panicles. The glumes and lemmas of the florets are convex on the back and little compressed, and the lemmas are hispid to puberulent especially at the base along the keel and lateral nerves. This species, one of the most common alpine members of the genus in the Pacific Northwest, is widely distributed in the mountains of southern British Columbia. In the northern part of its range it is restricted to the Coast Mountains and it extends westward to the Aleutian Islands and has been reported from Asia.

Poa stenantha probably occurs throughout the Queen Charlotte Ranges. It was collected at sea level at the base of the limestone cliffs on the east side of Koohoo Hill at the head of Cumshewa Inlet, and its known southern limit

on the Islands is from Mount de la Touche near the head of Fairfax Inlet. In the alpine zone it occurs on talus slopes, cliffs, and heathy knolls.

123. *Poa trivialis L., Sp. Pl. 1: 67. 1753.

GRAHAM ISLAND: Langara Island, *CST22563A;* near Queen Charlotte City, *CST34799;* near Yakoun River 4½ mi S of Port Clements, *CTS35034;* Honna River, *CT35401;* Mamin River Delta, *CT35539, CT35557.*

MORESBY ISLAND: Gray Bay, *CT35249A.*

Poa trivialis, a native of Eurasia, is a relatively rare introduction on the Queen Charlotte Islands. It was collected on a shingle beach near some old cabins at Henslung Bay, Langara Island, and the other records are from near settlements in the lowlands of eastern Graham and northeastern Moresby islands.

Puccinellia

This circumboreal genus has been the subject of many taxonomic treatments, but there is apparently no clear segregation of taxa in a number of the complexes nor a consistent alignment of relationships within the genus by any two authors. The nomenclature is voluminous and confusing, and the biological relationships appear to be poorly understood. Careful documentation and correlation of chromosome numbers for field collections and garden-transplant studies in a uniform environment are needed before any further systematic study is attempted. The taxonomic studies conducted on the northwestern American taxa have produced a multitude of entities and we are reluctant to accept a treatment like that proposed by Swallen (1944), in which 10 species are recognized for the Pacific coastal area of Alaska, or that proposed by Hultén (1950), in which eight species are recognized for this region. The recognition of so many species for a coastal strand plant restricted to such a small area is difficult to justify. For this reason we have not attempted to include any synonymy for the three species reported from the Charlottes.

Our material from the Islands has been identified by Dr. T. Sørensen and we essentially agree with his recognition of three taxa for the Islands. The relationship of the closed-panicled *P. nutkaensis* (Presl) Fern. & Weath. to the open-panicled *P. pumila* (Vasey) Hitchc. is still uncertain.

Panicle branches distinctly scabrous ..... *P. borealis*
Panicle branches glabrous or sometimes very sparsely scabrous
  Panicle branches spreading or reflexed, naked in lower half ..... *P. pumila*
  Panicle branches appressed, upright, floriferous to near base ..... *P. nutkaensis*

124. Puccinellia borealis Swallen, J. Wash. Acad. 34: 19. 1944.

GRAHAM ISLAND: Naden Harbour, *CT36864.*

MORESBY ISLAND: Skedans Islands, *CST22397.*

Puccinellia borealis is apparently restricted to the Pacific coastal regions of Alaska and British Columbia. The interior Alaska plants referred to this species by Swallen (1944, p. 19) were subsequently assigned to *P. interior,* a new species described by Sørensen (*in* Hultén, 1950, p. 1713). *Puccinellia borealis* is characterized by scabrous panicle branches and tall habit. It differs from the more southern Pacific coastal *P. grandis* Swallen by shorter anthers and lemmas and the disposition of the panicle branches.

Puccinellia borealis is the rarest species of *Puccinellia* on the Queen Charlotte Islands. It was found at only two coastal stations. At Naden Harbour it was a common element of the extensive tidal sedge meadow opposite Tee Island near the mouth of Lignite Creek.

125. Puccinellia nutkaensis (Presl) Fern. & Weath., Rhodora 18: 22. 1916.

GRAHAM ISLAND: Tlell, *CST21368;* NW corner Graham Island, *CST22629;* Masset Spit, *CST22651;* 1 mi W of Queen Charlotte City, *CT35419;* Long Inlet, *CT36007;* Naden Harbour, *CT36874.*

MORESBY ISLAND: Chaatl Narrows, *CST21787;* Copper Bay, *CST21899;* Gray Bay, *CT35238.*

Puccinellia nutkaensis occurs along the Alaska – British Columbia coast and is a common element of the coastal strand vegetation. The relationship of this species to *P. pumila* (Vasey) Hitchc. is not clear, and further studies may show that the two taxa should be considered one species. It is distinguished from *P. pumila* by usually having closely appressed panicle branches.

On the Queen Charlotte Islands it is widely distributed along the coast in stabilized habitats in the upper tidal zones. It is occasionally found in association with *P. pumila.*

126. Puccinellia pumila (Vasey) Hitchc., Amer. J. Bot. 21: 129. 1934.

GRAHAM ISLAND: Empire Anchorage, *CS21451;* Queen Charlotte City, *CST22433;* 1½ mi W of Tow Hill, *CST22729;* Dawson Inlet, *CST22932;* 1 mi W of Queen Charlotte City, *CT35420;* Kumdis Creek Delta, *CT36124;* Delkatla Slough, *CT36917;* Skidegate, July 18, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: head of Cumshewa Inlet, *CST21986, CT36243;* Kootenay Inlet, *CT36203;* Yakulanas Bay, *CT36644;* Rose Inlet, *CT36989.*

According to Sørensen (pers. comm.), *P. pumila* is a clear-cut species endemic to western North America. It is distributed along the Alaska –

British Columbia coast in brackish marshes and in the upper beach zone. This species is closely related to *P. nutkaensis* (Presl) Fern. & Weath., but can be distinguished from the latter species by the stiffly spreading or reflexed panicle branches.

Puccinellia pumila is the most common species of the genus on the Queen Charlotte Islands. It often forms a conspicuous band of vegetation in the upper tidal zone of shingle beaches or estuarine mud flats above the *Salicornia pacifica* zone.

Torreyochloa

127. Torreyochloa pauciflora (Presl) Church. Amer. J. Bot. 36: 163. 1949.
Glyceria pauciflora Presl, Rel. Haenk. 1: 257. 1830; *Puccinellia pauciflora* (Presl) Munz, Aliso 4: 87. 1958.

GRAHAM ISLAND: 3 mi N of Lawnhill, *CST21729A;* near Masset, *CST22763;* 6 mi S of Masset, *CST22812;* near Lawn Pt., *CST23270;* Tlell, *CST23496;* Juskatla, *S3512, S3548;* 4 mi N of Oeanda River, *CT35856;* Yakan Pt., *CT36818.*

The generic position of the "*pauciflora* group" of *Glyceria* has recently been discussed by Church (1949) and Clausen (1952). Church proposed its segregation from *Glyceria* and established a new genus *Torreyochloa* on the basis of morphological and cytological differences. Clausen, three years later, proposed the inclusion of Church's new genus in the closely related *Puccinellia.* This latter proposal was reviewed by Church (1952), who reiterated his reasons for the recognition of *Torreyochloa* and clearly defined the differences between *Glyceria, Torreyochloa,* and *Puccinellia.* We are following Church's 1952 treatment in referring our material to *Torreyochloa.*

Torreyochloa pauciflora was only collected in the lowlands of eastern and central Graham Island. In 1964 it was noted, though not collected, in the vicinity of Skidegate Lake and undoubtedly there are other suitable habitats for this species in the northeast section of Moresby Island between the head of Cumshewa Inlet and Sandspit. It is a lowland species found in low wet depressions in and along the margins of coniferous woods and alder thickets. A few collections were made around the margins of sedge swales in low-lying areas back of beach ridges at the coast.

Trisetum

Panicles dense and spikelike; basal sheaths puberulent	*T. spicatum*
Panicles loose and open; basal sheaths glabrous	*T. cernuum*

128. Trisetum cernuum Trin., Mém. Acad. St. Pétersb. VI. 1: 61. 1830.

GRAHAM ISLAND: about 3 mi S of Masset, *CST21272;* between Skidegate and Skidegate Village, *CST21439;* McClinton Creek, *CST21645;* near Skidegate Village, *CST21716;* 3 mi N of Lawnhill, *CST21729B;* about 6

mi SE of Port Clements, *CST22083;* about 1 mi W of Queen Charlotte City, *CST22462, CTS34800;* Langara Island, *CST22555;* Tow Hill, *CST22696;* near Juskatla, *S3504, T23;* 6 and 9 mi S of Juskatla, *CT35488A, T80;* Blackwater Creek, *CTS35056;* near junction of Yakoun River and Ghost Creek, *CT35505;* near Jalun Lake, *CT35683;* 4 mi S of Tlell, *CT35950;* Skidegate, July 29, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: Sandspit, *CST21818;* near mouth of Copper Creek, *CST21924;* Huston Inlet, *CST22196;* East Copper Island, *CST22207;* Echo Harbour, *CST22330;* Mt. de la Touche, *CT3609A;* mouth of Deena River, *CT23772* (DAOM); between Cumshewa and Peel inlets, *CT35194;* Kaisun, *CT36557.*

The population of *T. cernuum* on the Queen Charlotte Islands is extremely uniform and all collections belong to the typical phase. The plants have glabrous leaves and sheaths with leaves 6 to 11 mm wide and loosely flowered panicles with filiform, lax, or drooping branches that are naked below. The first glumes are 1.5 to 3 mm long and the second glumes range from 2.5 to 4.5 mm in length. Plants of this type also occur on the adjacent mainland and along the coast of Alaska northward to the Kenai Peninsula. In contrast, the more southern ssp. *canescens* (Buckl.) Calder & Taylor usually has pubescent leaves and sheaths, the leaves are up to about 7 mm in width, the panicles are usually narrower and sometimes spikelike, and the lowest fascicle of spikelets are almost sessile. The first and second glumes are stated to be 3 to 4 mm and 5 to 7 mm long, respectively, but in British Columbia material there appears to be a considerable overlap in the length of the glumes of the two subspecies. In the southern part of the province both ssp. *cernuum* and ssp. *canescens* occur at the coast and in the interior. A number of collections we have seen appear to be intermediate, but there is not a large enough body of material at hand to enable the differences between the two subspecies to be statistically evaluated.

Trisetum cernuum is one of the most common lowland grasses on the Queen Charlotte Islands. It is found in moist habitats along forest margins, in dense coniferous woods, on coastal bluffs, and along the upper limits of sea beaches.

129. Trisetum spicatum (L.) Richt., Pl. Europ. 1: 59. 1890.

MORESBY ISLAND: Takakia Lake, *CST23149, CT36371A.*

Hultén (1959), in a treatment of the polymorphic *T. spicatum* complex, recognized 14 subspecies, three of which, ssp. *spicatum,* ssp. *alaskanum* (Nash) Hult., and ssp. *molle* (Michx.) Hult., were recorded for coastal British Columbia. A fourth, ssp. *majus* (Vasey) Hult., was reported from southern Yukon to Colorado and California east of the Coast Mountains. In conclusion, Hultén states that "in southern Alaska and in the Rocky Mts., where the range of ssp. *spicatum* overlaps that of the other races, the differentiation between the different taxa becomes somewhat arbitrary." Although we

have not thoroughly examined the series of approximately 170 collections from Alaska, Yukon, and British Columbia in this institute, we do not believe that the segregates he recognizes in this region are realistic. The distributions (Figures 9 and 10) of the four subspecies that he recognizes are not phytogeographically meaningful. We have examined in detail the distribution of about 500 species of higher plants that occur in British Columbia and have not found a single species that has a number of races with superimposed distribution patterns. Also the morphological characters by which these four subspecies are distinguished appear to be insignificant when a large series of specimens is examined. There are apparently racial differences in the material from the Pacific Northwest, but it is not practical for us to give a detailed account at present.

The only collections from the Queen Charlotte Islands are from alpine habitats at Takakia Lake. In 1957 it was found on cliff ledges well above tree line at the east end of the lake and in 1964 a single atypical depauperate individual was collected on south-facing cliffs at the west end of the lake. Plants from the former station are 20 to 40 cm high and have glabrous culms, pilose leaf sheaths, ciliate-margined leaves (especially at the base), elongate somewhat loosely flowered panicles, and green- or purplish-tipped flowers. This collection matches material from mainland British Columbia, but differs from all Vancouver Island specimens we have seen in having glabrous culms. The single depauperate plant from the west end of the lake has a conspicuously pilose culm.

Vahlodea

130. Vahlodea atropurpurea (Wahlenb.) Fr. ssp. **paramushirensis** (Kudo) Hult., Fl. Kamtch. 1: 111. 1927.

Aira latifolia Hook., Fl. Bor.-Amer. 2: 243. *pl.* 227. 1840; *Deschampsia latifolia* Vasey, Grasses U.S. 29. 1883; *D. atropurpurea* var. *latifolia* Scribn. in Macoun, Cat. Can. Pl. 4: 209. 1888.

V. atropurpurea var. *paramushirensis* Kudo, J. Agr. Hokk. Sapporo 11: 71. 1922. *Deschampsia atropurpurea sensu* Amer. auth. in part.

GRAHAM ISLAND: Shields Bay, *CT23290, CT23344.*

MORESBY ISLAND: Mt. de la Touche, *CT23574, CT23598;* Mosquito Mtn., *CT23747;* Mt. Russ, *CT36153;* Takakia Lake, *CT36311;* Mt. Moresby, *CT36413A, CT36505.*

The western North American population of *V. atropurpurea* (Wahlenb.) Fr. has long been considered distinct from the European and eastern North American plant by most authors. Hultén (1942, p. 180) has pointed out the main differences between the two races in his *Flora of Alaska and Yukon.* After examining a series of about 75 collections from Alaska, Alberta, British Columbia, and the western United States we feel that recognition of a western subspecies is justified. Subspecies *paramushirensis* has broader leaves ranging from (2-)4 to 8.5 mm in width, whereas in the typical phase they are from 1 to

4 mm broad. Although the leaves of the Pacific plant are often more pubescent than in ssp. *atropurpurea,* this only applies to the plant along the British Columbia and Alaska coast. Collections examined from the interior of the province and from Washington, Oregon, Idaho, Montana, and Wyoming have glabrous, scabrous, or weakly pubescent leaves and are similar to the eastern North American and European plant in this character. The lemmas in ssp. *paramushirensis* range from about 1.8 to 3.0 mm long whereas in ssp. *atropurpurea* they are less than 2 mm long. The two subspecies cannot always be separated on the length of the callus hairs even though there is a strong tendency for the hairs to be shorter in relation to the length of the lemma in the western North American plant. The awns of the lemmas are exserted in both subspecies, but they are usually longer and more strongly exserted in ssp. *paramushirensis.*

On the Queen Charlotte Islands this species is restricted to the mountain ranges where it is usually found at or near tree line in meadows, on wet talus slopes, and in grassy-rocky runnels. One of the collections from the east slope of Mount de la Touche is from a shaded runnel below cliffs at about 400 ft above sea level, and the Mount Moresby collections are from a similar habitat along the north face of the mountain near its base.

Cyperaceae

Flowers unisexual, achene enclosed in a perigynium .... *Carex*
Flowers perfect or occasionally a few staminate only (*Rhynchospora*); achene not enclosed in a perigynium
  Achenes crowned with a tubercle
    Culms leafless, spikelets usually many-flowered .... *Eleocharis*
    Culms leafy; spikelets few-flowered ..... *Rhynchospora*
  Achenes not crowned with a tubercle
    Perianth of 1-8 short, inconspicuous bristles or none ..... *Scirpus*
    Perianth of many, elongate, conspicuous bristles ... *Eriophorum*

Carex

Inflorescence a single spike
  Stigmas 2; achenes lenticular
    Perigynia strongly divaricate or reflexed at maturity; plants caespitose ..... *C. pyrenaica*
    Perigynia neither strongly divaricate nor reflexed at maturity
      Plants rhizomatous; leaf blades flat; beaks of perigynia smooth; anthers and stigmas neither conspicuous nor long-persistent ..... *C. anthoxanthea*
      Plants caespitose; leaf blades involute; beaks of perigynia serrulate; anthers and stigmas conspicuous and long-persistent ..... *C. circinata*

Stigmas 3; achenes trigonous
Perigynia strongly divaricate or reflexed at maturity
Pistillate spikes comprised of about 15 or more long-stipitate perigynia 4 mm or less in length ..... *C. nigricans*
Pistillate spikes comprised of 7 or less short-stipitate perigynia 5 mm or more in length *C. pauciflora*
Perigynia neither strongly divaricate nor reflexed at maturity
Perigynia pubescent ..... *C. scirpoidea*
Perigynia glabrous
Plants rhizomatous ..... *C. anthoxanthea*
Plants caespitose
Perigynia beaked ..... *C. circinata*
Perigynia beakless ..... *C. leptalea*
Inflorescence of 2 or more spikes
Stigmas 2; achenes lenticular
Bracts of lowermost spikes leaflike, usually as long as or longer than the inflorescence
Plants with long stout rhizomes
Achenes not constricted on one side near the middle; subterminal spikes pistillate ..... *C. physocarpa*
Achenes usually constricted on one side near the middle; some of the subterminal spikes usually androgynous
Pistillate spikes (1-)2.5-8 cm long, lowermost usually on short, stiff, erect peduncles; basal leaf sheaths fibrillose *C. obnupta*
Pistillate spikes 0.8-3.5(-5) cm long, lowermost usually on long, flexuous, divaricate to drooping peduncles; basal leaf sheaths never conspicuously fibrillose ..... *C. lyngbyei*
Plants caespitose or occasionally with short slender rhizomes
Inflorescence congested; terminal spike gynecandrous ..... *C. enanderi*
Inflorescence rarely congested; terminal spike usually staminate, occasionally partially pistillate, never gynecandrous
Base of culms dark brown to reddish; lowermost spikes usually on long, divaricate to drooping peduncles; perigynia essentially nerveless ..... *C. sitchensis*

Base of culms never dark brown to reddish; lowermost spikes usually on short, stiffly ascending peduncles; perigynia nerved ..... *C. kelloggii*

Bracts of lowermost spikes scalelike or setaceous, usually much shorter than the inflorescence

Perigynia conspicuously wing-margined

Spikes aggregated into a dense head; pistillate scales dark copper-brown ..... *C. macloviana*

Spikes approximate but not aggregated into a dense head, pistillate scales light reddish-brown ..... *C. tracyi*

Perigynia often with sharp thickened edges but never wing-margined

Culms single or a few together arising from stout, long-creeping, fibrillose, blackish-brown rhizomes ..... *C. arenicola*

Culms caespitose or arising in approximate clusters from slender, short-creeping, nonfibrillose, light-brown stolons

Inflorescence compound-paniculate, each panicle branch usually bearing 2 or more spikes ..... *C. cusickii*

Inflorescence paniculate but not compound, each panicle branch bearing a single spike

Spikes androgynous; pergynia biconvex; plants stoloniferous ..... *C. disperma*

Spikes gynecandrous or pistillate; perigynia plano-convex; plants caespitose

Perigynia broadest near the base

Spikes, at least the lowermost, conspicuously separated and not overlapping the adjacent ones; beaks of perigynia weakly serrulate, 1 mm or less in length ..... *C. laeviculmis*

Spikes contiguous or aggregated, overlapping, the lowermost occasionally slightly remote; beaks of perigynia usually strongly serrulate, usually over 1 mm in length

Perigynia less than 3 mm long ..... *C. arcta*

Perigynia more than 3 mm long ..... *C. phyllomanica*

Perigynia broadest at or near the middle
Beaks of perigynia over 1.5 mm long ..... *C. deweyana*
Beaks of perigynia less than 1 mm long
Spikes, at least the lowermost, conspicuously separated
Largest leaves more than 2.5 mm wide ..... *C. canescens*
Largest leaves less than 2.5 mm wide ..... *C. brunnescens*
Spikes contiguous or aggregated into a short oblong or ovoid head
Largest leaves more than 2.5 mm wide ..... *C. canescens*
Largest leaves less than 2.0 mm wide ..... *C. glareosa*

Stigmas 3; achenes trigonous
Pistillate scales black or purplish black, sometimes brownish in *C. buxbaumii*
Terminal spike gynecandrous or with mixed pistillate and staminate flowers but never androgynous
Spikes sessile or essentially so; pistillate scales long-acuminate, tapering to a cuspidate tip less than 2 mm long ..... *C. buxbaumii*
Spikes, especially the lowermost, distinctly peduncled; pistillate scales obtuse to acute or mucronate
Lowermost spikes on long, divaricate, or drooping flexuous peduncles; pistillate scales lacking mucros or, if present, the mucros less than 0.5 mm long ..... *C. mertensii*
Lowermost spikes on short, ascending stiff peduncles; pistillate scales usually with some mucros about 2 mm long ..... *C. gmelinii*
Terminal spike staminate or occasionally androgynous
Pistillate scales acute to obtuse or, if cuspidate, the cusps less than 0.5 mm long ..... *C. stylosa*
Pistillate scales cuspidate or mucronate, the cusps or mucros usually more than 0.5 mm long
Pistillate scales cuspidate or mucronate, the cusps or mucros about 0.5-1 mm long .... *C. pluriflora*

Pistillate scales mucronate, some mucros over 2 mm long ..... *C. macrochaeta*
Pistillate scales never black or purplish black except occasionally in *C. buxbaumii*
Perigynia beakless or beak less than 0.5 mm long
Base of culms never reddish; pistillate scales acute to obtuse ..... *C. livida*
Base of culms reddish; pistillate scales long-acuminate, cuspidate ..... *C. buxbaumii*
Perigynia conspicuously beaked, the beak over 0.5 mm long
Perigynia pubescent ..... *C. brevicaulis*
Perigynia glabrous
Spikes aggregated into a dense head ..... *C. macrocephala*
Spikes not aggregated into a dense head
Perigynia 2-3 mm long ..... *C. viridula*
Perigynia 7-9 mm long ..... *C. exsiccata*

131. Carex anthoxanthea Presl, Rel. Haenk. 1: 203. 1828.

GRAHAM ISLAND: Empire Anchorage, *CS21460;* Tan Mtn., *CST-21620, CST21629;* near Skidegate, *CST21689;* July 11 and 16, 1910, *Spreadborough* (CAN); Langara Island, *CST22488;* Newton Pt., *CST22992;* Shields Bay, *CT23301;* about 10 mi SSE of Juskatla, *T13;* Dawson Inlet, *CTS35094;* Honna River, *CT35411;* about 14 mi S of Masset, *CT35575;* Jalun Lake, *CT35617.*

MORESBY ISLAND: Chaatl Narrows, *CST21748;* Newcombe Peak, *CST22021;* Bigsby Inlet, *CST22128;* Echo Harbour, *CST22325, CST22373* (DAOM); Takakia Lake, *CST23071;* Mt. de la Touche, *CT23532;* Anna Inlet, *CTS34948;* between Cumshewa and Peel inlets, *CT35176;* Upper Victoria Lake, *CT35813;* Kootenay Inlet, *CT36136;* Sunday Inlet, *CT36638;* Mosquito Lake, *CT36709.*

The essentially North American *C. anthoxanthea* extends from southern Vancouver Island north along the British Columbia coast to the Aleutian chain and Bering Sea islands of Alaska. It is strictly a coastal species in the southern part of its range but there is a single record (Omineca Mts., Aug. 3, 1941, *Fletcher,* V) from east of the Coast Mountains at about 56°N. According to Hultén (Map 233, 1942) it also extends inland north of the Gulf of Alaska.

Carex anthoxanthea is one of the most common sedges of wet, boggy, open-wooded habitats of the Queen Charlotte Ranges from sea level to well above tree line. In contrast to the closely related *C. circinata* C. A. Meyer, a strictly montane species, it is found sporadically in the lowland wooded muskegs of eastern Graham Island.

132. Carex arcta Boott, Ill. Carex 4: 155. *pl.* 497. 1867.

MORESBY ISLAND: Skidegate Lake, *CST21952, CT36069.*

Carex arcta is one of the most common and widely distributed sedges of marshy meadows, and moist thickets and woods throughout central and southern British Columbia. The only colony seen on the Queen Charlotte Islands was in a roadside marsh near the bridge that spans the narrows at the center of Skidegate Lake. It should be found elsewhere in the lowlands of eastern Graham and northeastern Moresby islands.

133. Carex arenicola Schmidt ssp. **pansa** (Bailey) Koyama & Calder, Can. J. Bot. 43: 1389. 1965.
C. pansa L. H. Bailey, Bot. Gaz. 13: 82. 1888.

GRAHAM ISLAND: Tlell, *CST23163, CST23175, CT35437.*

Carex pansa, which occurs on sand beaches and open, rocky sea bluffs along the Pacific coast of western North America, is closely related to *C. arenicola* Schmidt, a species of similar habitats that is found in Japan and on the adjacent Asiatic coast. There are only minor differences between these species and we believe that *C. pansa* should be treated as a race of the essentially Japanese *C. arenicola.* In ssp. *pansa* the scales are usually dark chestnut brown with conspicuous broad hyaline margins more than 2 mm wide, whereas in ssp. *arenicola* the scales are light brown with narrow yellowish to white hyaline margins that are rarely more than 2 mm wide. There is a marked tendency for ssp. *pansa* to have shorter and more congested inflorescences, and stolons and basal sheaths that are nearly always darker in color, but these characters are not always reliable for separating the two subspecies. We have seen only one collection from California (Carmel, Monterey Co., *Howell 28964*) and it has pale scales like the Japanese plant. Subspecies *pansa* is rare in British Columbia. In addition to the records from the Charlottes there is a single collection from Hope Island (between Roller Bay and Mexicana Pt., *Calder & MacKay 31193*) off the north end of Vancouver Island.

The three collections of ssp. *pansa* from the Queen Charlotte Islands are from open forests and meadows near the mouth of the Tlell River on the east coast of Graham Island. It occurs around slightly saline ponds back from the river on low ground that is subject to periodic flooding and among other sedges and grasses in the adjacent open and dry spruce forest. Even though it is found in an agricultural area there is no evidence that this species was introduced into the Islands.

134. Carex brevicaulis Mackenzie, Bull. Torrey Club 40: 547. 1913.

GRAHAM ISLAND: Towustasin Hill, *CT35524.*

Mackenzie (1935) in his treatment of *Carex* for *North American Flora* reported four species of the sect. *Montanae* Fries from Vancouver Island and

coastal British Columbia: *C. inops* L. H. Bailey, *C. brevicaulis* Mackenzie, *C. rossii* Boott, and *C. umbellata* Schk. (=*C. abdita* Bickn.). *Carex inops* is strikingly distinct, but the other three species belong to a complex group. They have culms possessing terminal clusters of spikes that are widely separated from basal clusters of short spikes, which are often inconspicuous and partially hidden in the basal leaves. *Carex brevicaulis,* a species of coastal bluffs and open rocky woods, occurs in the drier sections of eastern Vancouver Island and on the adjacent mainland. Typical collections can readily be distinguished from *C. rossii* by the plump, broad, and orbicular perigynia, short bracts of the lowermost nonbasal pistillate spikes, and relatively broad leaves. We have been unable to assign any collections from Vancouver Island to *C. rossii,* but there are a few collections that appear to be intermediate between this species and *C. brevicaulis.* In our opinion *C. umbellata* does not occur in British Columbia but is essentially an eastern species that reaches its western limit on the eastern flanks of the Rocky Mountains.

The collection from the Charlottes, which represents a range extension of about 400 miles to the north, is from steep south-facing cliffs at the base of Towustasin Hill near Juskatla. Here it is found with other disjunct species such as *Cerastium arvense* L. and *Saxifraga caespitosa* L.

135. Carex brunnescens (Pers.) Poir. in Lam., Encycl. Méth. Bot. Suppl. 3: 286. 1813.

C. sphaerostachya (Tuckerm.) Dewey, Amer. J. Sci. 49: 44. 1845; *C. brunnescens* var. *sphaerostachya* (Tuckerm.) Kük., Pflanzenreich IV. 38: 220. 1909.

GRAHAM ISLAND: near Yakoun River Delta, *CST21563;* 2½, 4, and 5½ mi SE of Port Clements, *CTS34599, CST22824A, CTS34590;* Juskatla, *T22;* 3 mi N of Port Clements, *T143;* 11½ mi S of Masset, *CT36902.*

The circumboreal *C. brunnescens* is widely distributed in Canada from the Atlantic to the Pacific Ocean. In North America two varieties are recognized by most authors: var. *brunnescens* with stiff, upright leaves and culms; a short straight inflorescence composed of greenish-brown spikes rarely over 4 cm long and with the lowermost spikes up to about 1 cm apart; and var. *sphaerostachya* (Tuckerm.) Kük. with softer and more flaccid leaves and culms, a flexuous inflorescence of greenish spikes, up to about 8 cm in length, and with the lowermost spikes usually more than 1 cm apart. The differences between the varieties appear to be merely ecological because var. *brunnescens* occurs in open exposed habitats from sea level to mountain summits, whereas the more southern var. *sphaerostachya* is a woodland phase. Plants with intermediate characters are frequent and we can see no clear line of demarcation between these two ecophenotypes.

Carex brunnescens is apparently rare in the Queen Charlotte Islands. It was only found in meadows and forest openings along the roads from Port Clements to Masset, Tlell, and Juskatla in the lowlands of eastern Graham Island. We are unable to explain why *C. brunnescens* was only found in a relatively small area in the southeast portion of Masset Inlet for there are many

suitable habitats for this species throughout the lowlands of Graham and Moresby islands.

136. Carex buxbaumii Wahlenb., Vet.-akad. Stockholm Nya Handl. 24: 163. 1803.

MORESBY ISLAND: Skidegate Lake, *CT23622, CT35278;* Upper Victoria Lake, *CT35759.*

Carex buxbaumii, a species of swamps and boggy meadows, occurs sporadically along the Alaska – British Columbia coast. We know of only two records from the central interior part of the province, but in the southern part of the Rocky Mountains Trench and in the Rocky Mountains it is common in calcareous sedge meadows and bogs.

This species is extremely rare on the Queen Charlotte Islands. It was collected in a sedge meadow and along the rocky shoreline at the east end of Skidegate Lake. In 1964 a small colony was found on a sparsely vegetated flat of a drainage course in the boggy meadows near our campsite at the east end of Upper Victoria Lake.

137. Carex canescens L., Sp. Pl. 1: 974. 1753.

Spikes not aggregated in dense heads; culms rarely stiffly erect ..... ssp. *canescens*
Spikes aggregated in dense heads; culms usually stiffly erect ..... ssp. *arctaeformis*

137a. Carex canescens L. ssp. **canescens**

GRAHAM ISLAND: Yakoun River Delta, *CST21562* (approaching ssp. *arctaeformis*).

MORESBY ISLAND: White Swan Bog, *CST21038, CST21932, CT-35298.*

137b. Carex canescens L. ssp. **arctaeformis** (Mackenzie) Calder & Taylor, Can. J. Bot. 43: 1389. 1965.
C. arctaeformis Mackenzie, N. Amer. Fl. 18: 97. 1931.

GRAHAM ISLAND: about 6 mi SE of Port Clements, *CST22085;* Langara Island, *CST22492;* near Tow Hill, *CST22736, CST22755;* near Yakoun River Delta, *CT35467;* about 4 mi N of mouth of Oeanda River, *CT35872;* Kumdis Creek Delta, *CT36116;* N of Skidegate, July 16, 1911, *Spreadborough* (CAN).

MORESBY ISLAND: White Swan Bog, *CST21933, CT35299;* Skidegate Lake, *CST21949, CT23638* (DAOM); Red Mud Marsh, *CST22056* (approaching ssp. *canescens*); between Moresby and Aero logging camps, *CT35289.*

Carex canescens is a variable species as to the width and color of leaves, the number, size, and disposition of spikes, and the color of scales and perigynia. Some North American authors recognize a number of varieties including var. *disjuncta* Fernald and var. *subloliacea* Laestad., but these entities appear to us to be merely ecological variants that occur scattered throughout the range of the species. Until someone undertakes a thorough study of this circumboreal species we are referring all North American collections to *C. canescens* in the broad sense, with the exception of ssp. *arctaeformis,* which is discussed in the next paragraph.

Henry in 1915 in *Flora of Southern British Columbia* recognized, but did not name, a new variety of *C. canescens.* It was briefly described as follows: "Spikes in a dense oblong or ovoid head, usually subtended by a bract 7 cm long; perigynia acutish at base, tapering at apex to a nearly or quite smooth beak. Elgin [near Vancouver]. This combination of characters does not seem constant. The locality which in 1913, produced this so distinct form, afforded in 1915, only plants with dense but bractless heads." In 1931 Mackenzie described Henry's unnamed variety at specific rank, stating that it has the perigynia characters of *C. canescens* but looks like *C. arcta* Boott. He cited three other localities, Cloverdale and Lulu Island in the lower Fraser River valley, and Sitka in the Alaska panhandle. Eastham (1947, p. 27), who has collected Mackenzie's *C. arctaeformis* in a peat bog on Lulu Island, states that it grows abundantly with *C. canescens* and that the two species can be readily distinguished at a distance by color and habit. In addition to the localities mentioned and the stations cited from the Charlottes, ssp. *arctaeformis* has been found near Cumberland (*Calder & MacKay 31843*) on Vancouver Island, and an alpine collection from the Itcha Mountains (*Calder et al. 20297*) in the coastal belt approaches this subspecies.

Carex arctaeformis in its extreme form with densely aggregated terminal spikes is quite unlike *C. canescens.* In contrast to *C. canescens* its culms are nearly always stiffly erect and roughened in the upper third; its leaves are sometimes conspicuously glaucous and exceed the fruiting culms; and its (3-) 4 to 5 (-6) spikes are densely aggregated in heads 1.3 to 2.1 cm long. There are other statistical differences, but the distinguishing characters mentioned should enable rapid identification of the two entities. As the perigynia of the two taxa appear to be identical and, as intermediates occur, we regard *C. arctaeformis* as a subspecies of *C. canescens.*

Both subspecies are found in lowland habitats, especially in the eastern sections of Graham and Moresby islands. They occur in and around the margins of bogs, in sedge marshes, and in wet habitats along creek banks in coniferous woods.

138. Carex circinata C. A. Meyer, Mém. Acad. St. Pétersb. Sav. Étr. 1: 209. *pl.* 6. 1831.

GRAHAM ISLAND: Empire Anchorage, *CS21466, CS21481;* Dawson Inlet, *CST22861, CTS35123;* between Ells and Mercer pts., *CST22868;*

Newton Pt., *CST22949;* Shields Bay, *CT23280, CT23355;* Jalun Lake, *CT-35643;* Long Inlet, *CT35982;* Dawson Harbour, June 24, 1897, *Newcombe* (CAN, V).

MORESBY ISLAND: Newcombe Peak, *CST22039;* Bigsby Inlet, *CST-22175, CTS34882;* Echo Harbour, *CST22354;* Takakia Lake, *CST23104;* Mt. de la Touche, *CT23531;* Anna Inlet, *CTS34947;* between Cumshewa and Peel inlets, *CT35206;* Upper Victoria Lake, *CT35723;* Mt. Russ, *CT36162;* Mt. Moresby, *CT36498;* Sunday Inlet, *CT36626;* Mike Inlet, *CT36668;* Tasu Sound, June 1901, *Newcombe* (V); Canoe Pass, July 26, 1910, *Spreadborough* (CAN).

Carex circinata has at times been confused with *C. anthoxanthea* Presl, the only other North American member of the sect. *Circinatae* Meinsh. However, they have different ecological requirements and are markedly distinct. Although the two species often grow in close proximity, *C. circinata* is restricted to rocky exposures, such as cliffs, talus slopes, and rocky knolls, whereas *C. anthoxanthea* grows in more mesic habitats, such as open boggy woods. *Carex circinata* is a densely caespitose species with strongly involute leaves in contrast to *C. anthoxanthea,* which has long-creeping rhizomes and flat leaf blades.

Carex circinata occurs along the Alaska coast from the Aleutian Islands to the Olympic Mountains of Washington. It is one of the most common and widely distributed species of rocky habitats in the Queen Charlotte Ranges from sea level to alpine summits well above tree line.

139. Carex cusickii Mackenzie in Piper & Beattie, Fl. NW. Coast 72. 1915.
C. diandra var. *ampla* (L. H. Bailey) Kük. in Engler, Pflanzenreich IV. 38: 177. 1909.
C. diandra var. *ramosa sensu* Henry, Fl. South. B.C. 62. 1915.

GRAHAM ISLAND: Yakan Pt., *CST22717, CST22734B.*

MORESBY ISLAND: White Swan Bog, *CST21934;* between Moresby and Aero Logging camps, *CT35288.*

Carex cusickii is a rare species on the Queen Charlotte Islands and is at or near the northern limit of its range along the Northwest Pacific coast. The only other collection from this latitude is from near Lakelse (*Calder et al. 13086*) in the Terrace area on the adjacent British Columbia mainland. The nearest coastal station is some 350 miles to the south, at Comox on Vancouver Island. We do not know whether this gap is real or merely a reflection of inadequate surveys along the intervening mainland coast. Such a disjunct distribution pattern is not unique as it occurs in other species, such as *Tolmiea menziesii* (Pursh) T. & G. and *Heuchera chlorantha* Piper.

There are only three stations for *C. cusickii* on the Charlottes. It is one of the dominant sedges in the extensive marshy meadows back of the beach ridges at Yakan Point, where it grows with such species as *Carex lyngbyei* Hornem. and *Eriophorum chamissonis* C. A. Meyer, and other sedges and grasses. It is

also common in the marshes and bogs at White Swan Bog a few miles north of Moresby Logging Camp and it was found in a small bog along the road between the head of Cumshewa Inlet and Aero Logging Camp.

140. Carex deweyana Schw. ssp. **leptopoda** (Mackenzie) Calder & Taylor, Can. J. Bot. 43: 1389. 1965.
C. leptopoda Mackenzie in Rydb., Fl. Rocky Mts. 124. 1917.

GRAHAM ISLAND: between Skidegate and Skidegate Village, *CST-21438, CT35841;* near Yakoun River Delta, *CST21564;* west of Queen Charlotte City, *CST22487;* Lawn Pt., *CT35444;* near junction of Yakoun River and Ghost Creek, *CT35502;* Mamin River Delta, *CT35556;* Long Inlet, *CT35975.*

MORESBY ISLAND: between Sandspit and Cape Chroustcheff, *CST-20982;* near Alliford Bay, *CST21852;* Alliford Bay, *CST21865;* 3 mi S of Copper Bay, *CST21892;* inlet between Harriet Harbour and Huston Inlet, *CST22249;* Limestone Island, *CST22411, CTS34811;* Skedans, *CST22428;* Gray Bay, *CST23425, CT35233;* Kaisun, *CT36540.*

Mackenzie (1931, p. 116, 117) and subsequent authors have considered *Carex* sect. *Deweyanae* Tuckerm. to be comprised of four species, of which three, *C. bolanderi* Olney, *C. leptopoda* Mackenzie, and *C. deweyana* Schw., occur in British Columbia and the western United States. In a recent paper (Calder and Taylor, 1965) we briefly discussed the relationships and distributions of these taxa and came to the conclusion that *C. leptopoda* is a weak entity that should be treated as a western race of the widely distributed *C. deweyana. Carex bolanderi,* which attains its best development in the coastal region, is restricted in the northern part of its range to the southwest section of British Columbia from the Cascade Mountains to the west coast of Vancouver Island. It can readily be distinguished from *C. deweyana* ssp. *deweyana,* which only extends as far west as the central part of the province. *Carex deweyana* ssp. *leptopoda* is the most widely distributed of the three taxa. Where its range overlaps that of *C. deweyana* ssp. *deweyana* in eastern British Columbia some collections are extremely difficult to identify. There is apparently little introgression on Vancouver Island, where it occurs in the same region as *C. bolanderi.*

The only taxon of this complex that occurs in the Queen Charlotte Islands is *C. deweyana* ssp. *leptopoda.* The population on the Islands is about 300 miles disjunct from *C. bolanderi* and about 260 miles disjunct from *C. deweyana* ssp. *deweyana.* Plants from the Charlottes can be characterized as follows: rootstocks elongate and well developed; basal leaf sheaths fibrillose; perigynia nearly always less than 4 mm long, conspicuously narrowed at the base, containing little spongy tissue in the lower portion. The 19 collections cited comprise a morphologically uniform series and none of them show any tendency towards either *C. bolanderi* or *C. deweyana* ssp. *deweyana.*

On the Queen Charlotte Islands ssp. *leptopoda* is strictly a lowland species that is found mainly in the eastern section of the islands from Masset Inlet

south to Skincuttle Inlet near the south end of Moresby Island. It usually occurs near the coast in open thickets, on logged-over forest, or on coastal bluffs, but occasionally it is found in the interior along open-wooded stream banks. The only record from the west coast is at Kaisun, where it was found with a number of adventives in the extensive meadow that fronts this abandoned Haida village.

141. Carex disperma Dewey, Amer. J. Sci. 8: 266. 1824.
C. tenella Schkuhr, Riedgr. 23. *pl.* Pp. *fig.* 104. 1801.

GRAHAM ISLAND: near Skidegate, *CST21698;* Kumdis Creek, *CST-22111;* about 3 mi NW of Tlell, *CST23476;* Mamin River about 8 mi SSW of Juskatla, *CT35484;* Mayer Lake, *CT36108;* about 4 mi N of mouth of Oeanda River, *CT35857.*

Hultén (1942, p. 327) has suggested that plants of *C. disperma* from Yukon and interior Alaska may represent a separate race. Admittedly some specimens, especially from the relatively dry interior valleys, are, as he states, "low grown with large, strongly inflated (plump) perigynia." Such a habit is at least partly an ecological response as depauperate plants are usually found on dry, sandy, or gravelly soils, for example, Big Delta, Alaska, *Cody & Webster 6036.* On the other hand coastal plants are on the average taller, occasionally reaching a height of 55 cm (*CST23476*), yet in dry habitats they may be as low-grown as those from the interior. The size and shape of the perigynia of *C. disperma* are also extremely variable in both regions. We examined over 100 collections of this species from the Pacific Northwest and were unable to find any morphological differences that could be used to separate the coastal and inland populations.

Carex disperma, one of the most common sedges in British Columbia, is extremely rare in the Queen Charlotte Islands. It was only collected a few times in moist, mossy, forested areas, especially by creeks and pools in the spruce–hemlock lowlands of eastern Graham Island.

142. Carex enanderi Hult., Fl. Alaska & Yukon 2: 355. 1942.
C. eurystachys Hermann, Leafl. West. Bot. 8: 109. 1957.

MORESBY ISLAND: Takakia Lake, *CST23132, CT36365.*

The description of *C. enanderi* by Hultén in 1942 was based on collections by Enander from Skagway and by Rudd from Akutan Island in the Aleutian chain. Over the past 22 years this species has been collected at a number of other localities in Alaska and has recently been found in British Columbia and Alberta (Calder and Taylor, 1965). *Carex enanderi,* which is strictly distigmatic, does not belong to the sect. *Atratae* Kunth, as stated by Hultén, but is in the sect. *Acutae* Fries and is closely related to *C. kelloggii* W. Boott. Intermediate plants between these species have been noted from Kodiak, Knight, and Attu islands along the Alaska coast and from the Commander Islands in the Bering Sea. Mackenzie in his descripion of *C. kelloggii* states that the staminate spikes

are rarely somewhat pistillate and such a description could well apply to those plants that we consider to be intermediates. In 1957, Hermann described *C. eurystachys* from Cavell Lake in Jasper National Park, Alberta. We have seen an isotype of *C. eurystachys* and it is a perfect match for the holotype of *C. enanderi* that we had on loan from the Naturhistoriska Riksmuseum in Stockholm.

Carex enanderi is an alpine or subalpine species that grows in boggy or gravelly areas around the margins of ponds and lakes. On the Queen Charlotte Islands it was only collected along the gravel shorelines of Takakia Lake and along the margins of nearby pools and ponds in the subalpine zone. The collections are somewhat atypical, but they have congested spikes with the terminal one gynecandrous, a feature that is characteristic of *C. enanderi*.

143. Carex exsiccata L. H. Bailey, Mem. Torrey Club 1: 6. 1889.
C. vesicaria var. *major* Boott in Hook., Fl. Bor.-Amer. 2: 221. 1839.
C. exsiccata var. *globosa* L. H. Bailey, Mem. Torrey Club. 1: 7. 1889.
C. exsiccata var. *pungens* L. H. Bailey, *l.c.*

GRAHAM ISLAND: about 3 mi E of Tow Hill, *CST22733;* 2 mi S of Rose Spit, *CT35909;* Yakoun Lake, *CT36750.*

MORESBY ISLAND: about 3 mi E of Skidegate Lake, *CST21922;* Red Mud Marsh, *CST23186;* E end of Skidegate Lake, *CT23623, CT36073;* Skidegate Lake Bridge, *CT36732.*

Both *C. exsiccata* and the closely related *C. vesicaria* L. have been reported in a number of floras as occurring in British Columbia. However it is doubtful if *C. vesicaria* occurs in the province as it has not been found during our surveys of British Columbia over the past 12 years and there are no collections in the herbaria of the Provincial Museum at Victoria, the University of British Columbia, or the National Museum at Ottawa. All plants we have seen from British Columbia closely match the excellent drawing of *C. exsiccata* in Boott's *Illustrations of the genus Carex* (1867, p. 162, *pl.* 537). The drawing was based on a Lyall collection from Saturna Island near Vancouver. Bailey's var. *globosa* and var. *pungens* are merely morphological extremes in a species that, like others (e.g., *C. rostrata* Stokes and *C. saxatilis* L.) in the sect. *Vesicariae* Tuckerm., show a wide range of morphological variation. We have seen a few atypical sterile specimens that probably represent hybrids with *C. rostrata.* Mackenzie (1935, p. 453) recorded *C. exsiccata* from southeastern Alaska, but Hultén (1942, p. 378) deleted this species from his *Flora of Alaska and Yukon* and assigned the collection(s) referred to by Mackenzie to *C. rostrata.* However, the range of *C. exsiccata* does include Alaska because we have seen a collection (*McCabe 8603*) from the Ketchikan Lakes on Revillagigedo Island in the extreme southern part of the Alaska panhandle.

On Graham Island this species was collected or noted in marshy meadows in the vicinity of Tow Hill and Rose Spit; in sedge meadows along the shores of Jalun and Yakoun lakes; and in swampy woods near the mouth of the Oeanda

River. In northeastern Moresby Island it is common in marshes and boggy meadows along the road between Sandspit and Moresby Logging Camp. *Carex exsiccata* is a late-flowering species and is probably more widely distributed in the eastern lowlands than our few records indicate.

144. Carex glareosa Wahlenb., Vet.-akad. Stockholm Nya Handl. 24: 146. 1803.

C. marina sensu Dewey, Amer. J. Sci. 29: 247. 1836.
C. bipartita var. *glareosa* (Wahlenb.) Polunin, Nat. Mus. Can. Bull. 92: 114. 1940.
C. bipartita var. *amphigena* (Fernald) Polunin, *op. cit.*, 115.

GRAHAM ISLAND: Tlell, *CST21369;* McClinton Bay, *CST21571.*

MORESBY ISLAND: Kootenay Inlet, *CT36202.*

The closely related *C. glareosa* and *C. mackenziei* Krecz. of the sect. *Heleonastes* Kunth have been confused by some authors because the diagnostic characters used for distinguishing them are not always reliable. For example, Mackenzie (1931, p. 84, 85) in his key to the *Heleonastes* distinguished the two species on the basis of the number of spikes per culm and the position of the basal spike. There are, however, three spikes per culm in many of the collections of *C. glareosa* and *C. mackenziei* that we have examined and the spikes are not always congested in the former nor are the lowest ones always remote on the latter. In *C. glareosa* the culms are usually flexuous or even decumbent, the scales are typically dark brown without conspicuous pale midveins, and the leaves are narrower and the perigynia are smaller than in *C. mackenziei.* The more upright, stiffer-culmed, and broader-leaved *C. mackenziei* can nearly always be readily distinguished by its conspicuous two-toned scales. Although the two species may grow together in the same habitat, we have seen no evidence of hybridization. We agree with Hultén (1962, p. 194) that *C. bipartita* var. *amphigena,* which has abruptly beaked, ellipsoid to ovoid perigynia, is only a phase of the variable *C. glareosa* and should not be formally recognized.

Carex glareosa occurs in saline or brackish marshes along the Alaska and British Columbia coasts at least as far south as Bella Coola (*Calder, Parmelee, & Taylor 18482*). On the Queen Charlotte Islands there are few suitable habitats for this species on the exposed headlands, bluffs, and sand or gravel beaches along the east and west coasts of Graham and Moresby islands. It is probably present in saline marshes of protected bays and inlets, and on estuaries along the brackish shorelines of Masset Inlet.

145. Carex gmelinii H. & A., Bot. Beech. Voy. 118. *pl.* 27. 1832.

GRAHAM ISLAND: Lepas Bay, *CST22620;* between Ells and Mercer pts., *CST22871;* Tlell, *CST23249.*

MORESBY ISLAND: Hotspring Island, *CST22291;* Skedans Islands, *CST22385.*

Carex gmelinii is of local occurrence in the Queen Charlotte Islands, where it is restricted to bluffs and meadows in exposed situations at the coast. Although it is common northward along the Alaska coast, we have seen no collections from mainland British Columbia south of Prince Rupert. It is probably present on many of the islands bordering Queen Charlotte Sound, for in 1961 it was found at Cape Scott at the northwest tip of Vancouver Island and on nearby Hope Island. As far as we are aware these records and a collection from Pine Island at the entrance to Queen Charlotte Strait are the southernmost in North America. It was erroneously reported by Henry (1915, p. 68) as occurring as far south as Oregon.

146. Carex kelloggii W. Boott in S. Wats., Bot. Calif. 2: 240. 1880.
C. decidua Boott, Ill. Carex 1: 63. 1858, as to North American plants only.
C. hindsii Clarke, Kew Bull. Add. Ser. 8: 70. 1908.
C. goodenovii sensu Henry, Fl. South. B.C. 65. 1915.

GRAHAM ISLAND: Empire Anchorage, *CST21504;* about 3 mi NW of Tlell, *CST22076;* near Tow Hill, *CST22659, CST22752;* near Lawn Pt., *CST23271;* about 9 mi S of Juskatla, *T77;* 3 mi E of Juskatla, *CTS35050;* Dawson Inlet, *CTS35092;* Collinson Lake, *CT35514;* near mouth of Oeanda River, *CT35892;* Yakoun Lake, *CT36763, CT36781;* Masset, Sept. 25, 1912, *Green* (UBC).

MORESBY ISLAND: 3 mi S of Copper Bay, *CST21893;* Skidegate Lake, *CST21956, CST23418;* between Cumshewa and Peel inlets, *CT35215;* Upper Victoria Lake, *CT35785.*

Mackenzie (1935, p. 387, 388) in a treatment of the genus *Carex* for North America recognized both *C. kelloggii* and *C. hindsii.* He reported both species from British Columbia and Alaska and in his key to the sect. *Acutae* Fries they are distinguished as follows:

Perigynia light green or in age glaucous green, nerved, very minutely granular, scales long-persistent ..... *C. kelloggii*
Perigynia yellowish green, ribbed, papillate-roughened, scales deciduous ..... *C. hindsii*

A comparison of Mackenzie's descriptions for the two species indicates other slight differences. In *C. kelloggii* the ligule is stated to be longer than wide, the terminal spike staminate (rarely somewhat pistillate) with purplish-brown scales and more or less strongly peduncled, the pistillate spikes approximate or slightly separate, and the perigynia weakly several-nerved on both faces. In *C. hindsii* the ligule is said to be as wide as long, the terminal spike staminate with purplish-black scales and short-peduncled or sessile, the pistillate spikes more or less strongly separate or the upper approximate, and the perigynia usually weakly 5-ribbed on both faces. Hultén (1942, p. 337) was reluctant to accept *C. hindsii* as a distinct species, but he recognized both species in his *Flora of Alaska and Yukon.* In his key to the distigmatic multispiked group he differentiated the two species as follows:

Scales acute with prominent midvein, distinctly scarious-margined, spikes slender ..... *C. kelloggii*
Scales blunt with a less prominent midvein, not or inconsiderably scarious-margined, spikes thicker ..... *C. hindsii*

Hultén was aware of the great variation in the diagnostic characters he used to separate the two species and stated that "*C. hindsii* seems to be merely a coastal race of *C. kelloggii*." As he pointed out, many collections from along the British Columbia and Alaska coast have scales that are blunt, inconspicuously midveined, and lack, or have very narrow, scarious margins. This is the common phase on the Queen Charlotte Islands, but such plants also occur throughout the range of this complex in the interior of British Columbia. In contrast there is a tendency for plants from east of the Coast Mountains to have conspicuously scarious-margined scales with prominent pale midveins. This phase also occurs at the coast and a few collections from the Queen Charlotte Islands are of this type. Intermediate plants combining the characters emphasized by Mackenzie and Hultén for *C. kelloggii* and *C. hindsii* are found throughout the entire range of this complex in British Columbia and along the Alaska coast.

We have examined about 180 collections of this complex from British Columbia and Alaska, including the Alaskan material of the Gray Herbarium and Smithsonian Institution, and have come to the conclusion that there is no justification for the recognition of *C. hindsii* at specific or subspecific rank. All the distinguishing characters enumerated by Mackenzie and Hultén, such as the ratio of ligule length to width; the shape, color, and type of margins and midveins of the scales; the length of the peduncles of the staminate spikes; the relative position and width of the pistillate spikes; and the color, texture, and markings of the perigynia, break down when a large series of specimens are examined. The description of *C. hindsii* by Clarke is so meager and imprecisely worded that it could apply to a number of species of *Carex* that occur in western North America. We have not seen the type collection from the Columbia River, but we presume that Mackenzie was correct in interpreting it as part of the *C. kelloggii* complex.

Carex kelloggii occurs throughout the Charlottes, especially in the lowland sections of eastern Graham and northeastern Moresby islands. It is found in and along the margins of sphagnum bogs, in sedge meadows, in logged-over forests, and along the sand and gravel shorelines of lakes. One of the collections from Yakoun Lake (*CT36763*) is atypical in having the lowest spikes long-peduncled and perigynia with narrowly pointed scales. It may represent a hybrid between this species and the closely related *C. sitchensis* Prescott.

147. Carex laeviculmis Meinsh., Bot. Centralbl. 55: 195. 1893.

GRAHAM ISLAND: Mercer Lake, *CS21499;* Empire Anchorage, *CS21507A;* Yakoun River Delta, *CST21561;* McClinton Bay, *CST21666;* near Skidegate, *CST21692*, June 16, 1910, *Spreadborough* (CAN); about 3 mi NW of Tlell, *CST22074;* Lepas Bay, *CST22613;* 4 mi S of Masset, *CST22808;*

Blackwater Creek, *T34;* 4 mi S of Juskatla, *S3535;* 4½ mi S of Port Clements, *CTS35031;* 3 mi E of Juskatla, *CTS35048;* Lawn Pt., *CT35443;* near junction of Yakoun River and Ghost Creek, *CT35501;* Mamin River Delta, *CT35555.*

MORESBY ISLAND: Skidegate Lake, *CST21016;* near head of Cumshewa Inlet, *CST21045;* near Alliford Bay, *CST21851;* below Newcombe Peak, *CST22048;* Echo Harbour, *CST22382;* Kootenay Inlet, *CT36209.*

Carex laeviculmis is a common sedge in the Alaska panhandle and along the British Columbia coast. It also occurs in isolated populations in the Selkirk and Purcell mountains in the southern interior part of the province. This species was reported by Holm (1900, p. 267) from Kussiloff [Kasilof] in the Kenai peninsula, but it is doubtful if it occurs that far north in Alaska.

This species is widely distributed throughout the lowlands of the Queen Charlotte Islands, along stream banks, on lakeshores, in margins of bogs, and in wet mossy depressions of dense coniferous forests.

148. Carex leptalea Wahlenb. ssp. **pacifica** Calder & Taylor, Can. J. Bot. 43: 1391. 1965.

GRAHAM ISLAND: about 8 mi SSW of Juskatla, *CT35485;* Yakoun Lake, *CT36748.*

MORESBY ISLAND: near mouth of Copper Creek, *CST21925;* White Swan Bog, *CST21931, CT35303;* below Newcombe Peak, *CST22047;* Echo Harbour, *CST22346;* between Gray and Sheldens bays, *CST23440;* between Peel and Cumshewa inlets, *CT35217* (Holotype); Upper Victoria Lake, *CT35727;* Kootenay Inlet, *CT36208;* Mosquito Lake, *CT36716.*

During the course of our surveys of the Queen Charlotte Islands and Vancouver Island it became evident that the coastal population of *C. leptalea* Wahlenb., with the exception of a few collections, was distinct from the plant of interior British Columbia, Yukon, and Alaska. Hultén (1942, p. 306) was aware of these differences because he pointed out in his treatment of *Carex* for Alaska and Yukon that a Howell collection from Yes Bay in the Alaska panhandle (about 180 miles north of the Queen Charlotte Islands) differed from other northern collections of *C. leptalea.* The plants of Yes Bay have longer perigynia and possess long-mucronate and aristate rather than obtuse or short-mucronate pistillate scales. Unfortunately, little material was available from the Alaska – British Columbia coast when Hultén wrote his flora and no reasonable decision could be reached as to whether there was both a coastal and an inland race. In a recent paper (Calder and Taylor, 1965) we have recognized the northern Pacific coast population of southeastern Alaska and British Columbia as a distinct race, ssp. *pacifica.* We have discussed its relationship to the wide-ranging typical phase and to ssp. *harperi* (Fernald) Stone of the southeastern United States. In comparison to the typical phase, ssp. *pacifica* is usually a more robust plant with broader leaves, longer spikes, more conspicuous staminate spikelets, longer perigynia, and more conspicuously aristate

or cuspidate scales that have darker brown margins. The perigynia of ssp. *pacifica* are a deeper green, but this is only evident when a series of perigynia of both races are compared.

Carex leptalea ssp. *pacifica* is a widely distributed element of wet boggy lowland habitats throughout the Charlottes, but it also occurs in mossy forest openings and in meadows and on gravel flats along lake and river margins.

149. Carex livida (Wahlenb.) Willd., Sp. Pl. 4: 28. 1805.
C. livida var. *grayana* Fernald, Rhodora 28: 8. 1926.

GRAHAM ISLAND: between Tow Hill and Rose Spit, *CST21229;* 7½ mi S of Masset, *CST21258;* about 8 mi SE of Port Clements, *CST21359;* Empire Anchorage, *CS21458;* McClinton Bay, *CST21628;* about 2 mi E of Tow Hill, *CST22746;* Newton Pt., *CST22981;* 3½ mi NW of Tlell, *CTS34608;* Jalun Lake, *CT35655.*

MORESBY ISLAND: White Swan Bog, *CST21029;* Chaatl Narrows, *CST21749;* Red Mud Marsh, *CST22058, CT35375;* Echo Harbour, *CST-22369;* Mosquito Mtn., *CT23728;* Anna Inlet, *CTS34958;* Upper Victoria Lake, *CT35737;* Kootenay Inlet, *CT36183;* Mike Inlet, *CT36666.*

In a treatment of *C. livida,* Fernald (1926) recognized three races: var. *livida,* a plant of the limestone barrens of northern Newfoundland, Banff National Park in the Rocky Mountains of Alberta, Lapland, and adjacent northern Scandinavia; var. *rufinaeformis* Fernald, based on a single collection from northern Newfoundland; and the widely distributed var. *grayana* (Dewey) Fernald of boreal North America, Scandinavia, and the USSR. We have seen no material of var. *rufinaeformis,* which apparently only differs from var. *livida* in possessing gynecandrous rather than staminate or androgynous terminal spikes. In the eighth edition of Gray's Manual (1950, p. 360, 361), Fernald distinguished var. *grayana* from var. *livida* as follows:

Culms 0.5-3 dm high, arching; pistillate spikes 0.7-1.5 cm long, the lower one frequently remote, subradical, and long-peduncled; staminate spike 0.7-1.5 cm long, perigynia 2.2-3.2 mm long, round or obtuse at summit ..... var. *livida*

Culms 1.5-4.5 dm high, erect, rarely with basal spikes; pistillate spikes 0.7-2.5 cm long; staminate spike 1.5-2.5 cm long; perigynia 3.2-4.6 mm long, tapering to acute or slenderly conical summit ..... var. *grayana*

The stature, presence or absence of long-peduncled subradical spikes, the length of the staminate and pistillate spikes, and the length and shape of the perigynia are found to be extremely variable when a larger number of specimens are examined. The 12 collections from the 1957 survey of the Queen Charlotte Islands, comprising 160 individual plants, were examined with the following results:

1. Subradical spikes are present in nine collections and the total number of plants with such spikes in any one collection ranges between 3 and 50 percent.
2. The pistillate spikes vary from 0.8 to 1.8 cm in length and the staminate spikes from 1.0 to 2.2 cm in length.
3. The perigynia vary from 2.8 to 4.8 mm in length and are slenderly conical to rounded at the apex.

The distinguishing characters used by Fernald in separating the two varieties cannot be correlated and many of the plants can be placed in one variety or the other depending on which characters are emphasized. We critically examined the population from the Queen Charlotte Islands and a large series of specimens from Scandinavia and North America and we have concluded that there is no justification for the recognition of var. *grayana* on either morphological or phytogeographical grounds.

Carex livida is common throughout the Islands in muddy areas in and at the margins of bog pools. It is essentially a lowland species but extends to tree line in the Queen Charlotte Ranges.

150. Carex lyngbyei Hornem., Fl. Dan. 32: 6. *pl.* 1888. 1827.

C. cryptocarpa C. A. Meyer, Mém. Acad. St. Pétersb. Sav. Étr. 1: 226. *pl.* 14. 1831; *C. lyngbyei* ssp. *cryptocarpa* (C. A. Meyer) Hult., Fl. Kamtch. 1: 188. 1927.

GRAHAM ISLAND: Delkatla Inlet, *CST21295;* Yakan Pt., *CST21315, CST22722;* Tlell, *CST21379, CST23153, CT35940;* between Skidegate and Skidegate Village, *CST21416;* McClinton Bay, *CST21639;* Kumdis Creek, *CT22106;* Langara Island, *CT22589;* Lepas Bay, *CST22616;* 3 mi N of Port Clements, *T139;* Skidegate, July 15, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: Alliford Bay, *CST21125;* head of Cumshewa Inlet, *CST21994;* Bag Harbour, *CST22187;* Hotspring Island, *CST22295;* Echo Harbour, *CST22313;* Rose Inlet, *CT36994;* Church Creek, *Pillsbury 342, 343* (DAO, UBC); Kaisun, July 13, 1897, *Newcombe* (CAN).

Carex lyngbyei Hormen. × **Carex sitchensis** Prescott

MORESBY ISLAND: Red Mud Marsh, *CST22060, CST23185, CT-35359, CT35361.*

Hultén (1927, p. 188) considers the Pacific coast *C. lyngbyei* to belong to a distinct race ssp. *cryptocarpa,* which can be distinguished from the Atlantic plant (ssp. *lyngbyei*) by its taller growth and consistently incised achenes. However, the utilization of stature as a diagnostic character for distinguishing races must be used with caution, especially in maritime species, as the stature often differs greatly depending on the environment. The Pacific coast plants of *C. lyngbyei* tend to be short when they occur in exposed habitats along the lower limits of sea beaches where there is a strong tidal effect. In contrast, plants found in protected bays and inlets and in saline meadows back from the shoreline are usually taller and more robust. On the Queen Charlotte Islands

plants of *C. lyngbyei* are often less than 20 cm tall, thus they are much shorter than many of the plants of this same species from the Atlantic coast. We have examined a number of collections from both coasts and there appears to be a tendency for a larger percentage of the Pacific coast plants to have incised achenes. However, we have been unable to find any consistent character to separate the east coast plants from those of the Pacific coast and we do not support the retention of ssp. *cryptocarpa* as a distinct race.

On the Queen Charlotte Islands *C. lyngbyei* is the dominant sedge of coastal saline meadows and at times forms pure dense stands, especially on muddy tidal flats. A number of colonies of the hybrid *C. lyngbyei* × *C. sitchensis* were found along the muddy margins of rivulets in Red Mud Marsh a few miles south of Sandspit on the road to Copper Bay. The occurrence of a fresh-water and saline species growing together is readily explained, as the marsh is at the coastline and is partially flooded during extreme high tides. *Carex sitchensis* belongs to the sect. *Acutae* Fries and *C. lyngbyei* to the sect. *Cryptocarpae* Tuckerm. In our view, the lack of any good diagnostic characters for separating the two sections and the apparent ease of hybridization between members show that the two sections should be combined.

151. Carex macloviana d'Urv. ssp. **pachystachya** (Cham.) Hult., Fl. Alaska & Yukon 2: 318. 1942.

C. pachystachya Cham. in Steud., Syn. Cyp. 197. 1855; *C. macloviana* var. *pachystachya* (Cham.) L. H. Bailey, Mem. Torrey Club 1: 51. 1889.

GRAHAM ISLAND: about 3 mi NW of Tlell, *CST22073, CST23480;* Torrens Island, *CST22441;* near Yakoun River Delta, *CST23499;* Image Pt., *CT35379;* 2½ mi S of Tlell, *CT35943;* Skidegate Village, *CT36955;* Skidegate, July 19, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: Sandspit, *CST21821;* near Alliford Bay, *CST-21867;* Mt. Moresby, *CT35319.*

We do not feel that any sound decision can be made concerning the taxonomic disposition of entities in the *C. macloviana – C. pachystachya* complex until a thorough comparative study is made of the disjunct populations that occur in Scandinavia, Iceland, Greenland, North America, the Hawaiian Islands, Mexico, South America, the Falkland Islands, and eastern Asia. We have collected more than 100 numbers of this complex from Alaska, Yukon, and British Columbia over the past 15 years, but we lack enough material from some of the other areas to reach any decision as to the number of taxa that should be recognized. Kükenthal (1909, p. 195) recognized a single species, *C. macloviana* d'Urv., with eight varieties including var. *pachystachya.* We do not agree with his treatment of the North American population, but his recognition of at least two segregates in southern South America seems justified on the basis of a small series of specimens that Dr. Manuel Barros of Buenos Aires kindly sent us a few years ago. Kükenthal reported the typical phase from Greenland, Labrador, and the western United States, and indicated that var.

pachystachya was restricted to North America, where it extends from Alaska south to Texas. Mackenzie (1931) in his treatment of the North American species of *Carex* recognized these two taxa as species, with *C. macloviana* extending from Labrador to Mackenzie District, and *C. pachystachya* ranging from Alaska south to Wyoming and California. Porsild (1939, 1951) considered the Alaska–Yukon plant of this complex to be *C. macloviana,* but Hultén (1942, p. 318) in his *Flora of Alaska and Yukon* recognized only ssp. *pachystachya* in this region. There is little unanimity as to the precise morphological differences and ranges of the two taxa and, except for Kükenthal's study, there is no evidence that any serious attempt has been made to solve the taxonomic problems in this complex.

The collections from the Queen Charlotte Islands that we are referring to ssp. *pachystachya* are high-grown (3.5-7 dm) and possess plano-convex perigynia with brownish-tipped beaks. According to Mackenzie, *C. macloviana* is a smaller plant with concavo-convex perigynia that have conspicuously hyaline-tipped beaks. The Queen Charlotte Island population is extremely uniform and matches a large series of this complex that we have seen from other parts of British Columbia. However, northward in Alaska and Yukon there is a great deal of variation, especially as to plant size, perigynia shape, color of the pistillate scales, and color of the tips of the perigynia beaks. A number of collections from along the Gulf of Alaska have very dark scales and the shape of the perigynia seems to be intermediate between that of the two subspecies.

In the Queen Charlotte Islands ssp. *pachystachya* is restricted to the lowlands of eastern Graham and northeastern Moresby islands. It occurs in meadows, on coastal bluffs, and occasionally in gravel along roadsides, where it is an obvious local introduction.

152. Carex macrocephala Willd. in Spreng., Syst. 3: 808. 1826. **Figures 50 and 51.**

C. anthericoides Presl, Rel. Haenk. 1: 204. 1828; *C. macrocèphala* ssp. *anthericoides* (Presl) Hult., Fl. Alaska & Yukon 2: 317. 1942.

GRAHAM ISLAND: Rose Spit, *CST21217,* Sept. 1911, *Newcombe* (V); Lepas Bay, *CST22610;* mouth of Sangan River, *CST22767;* Tlell, *CST23182, CTS34643, CTS35074,* June 2, 1951, *Cowan* (UBC), *Pillsbury 387* (UBC); about 4 mi N of mouth of Oeanda River, *CT35859;* Mayer Lake, *CT36104.*

In 1909 Kükenthal placed the distinctive, large-headed *C. macrocephala,* which occurs along the Pacific coast of Asia and North America, in a separate monotypic section, *Macrocephalae.* Kükenthal's treatment of this species was followed by that of Mackenzie (1931) when he wrote the genus *Carex* for *North American Flora.* In 1930 Ohwi described an additional species for the section, *C. kobomugi* of Japan. The two taxa in our opinion are quite distinct and we believe they should be retained at specific rank although some Japanese botanists regard *C. kobomugi* as a variety of *C. macrocephala.*

Two years after Willdenow described *C. macrocephala* from Asia, Presl

recognized the North American Pacific coast population, based on a Haenke collection from Nootka (Vancouver Island), as a distinct species, *C. antheri-coides*. Hultén (1942, p. 317) in his *Flora of Alaska and Yukon* has taken up Presl's name and considers the North American population to be a distinct race, *C. macrocephala* ssp. *anthericoides*. However, there is no justification for the recognition of a distinct North American race. We have examined a large series of *C. macrocephala* from British Columbia, Alaska, and Japan, and we are unable to find any differences between the two populations. Hultén may have been misled by Fernald (1930*c*), who identified the adventive of the New Jersey – Virginia coast as *C. macrocephala* rather than *C. kobomugi*. In his paper, Fernald then proceeded to compare the Pacific coast plants of western North America with Japanese material that he thought belonged to *C. macro-cephala* of Japan, but which probably included specimens of both this species and *C. kobomugi*. Fernald naturally arrived at the conclusion that *C. macro-cephala* of the Pacific coast of North America was different and distinct from the Japanese population and called the North American native plants *C. anthericoides*. Later in the eighth edition of *Gray's Manual* he realized the error in his initial identification of the introduced *C. kobomugi* of coastal sand dunes along the eastern American coast.

On the Queen Charlotte Islands, *C. macrocephala* was only found on Graham Island. It is common on the extensive sand beaches and dunes along the east and north coasts from Tlell to Rose Spit and from this point west to near Masset. There is also an isolated record from the large crescent beach at Lepas Bay at the northwest tip of Graham Island, and a few sterile plants were found at the south end of Mayer Lake in roadside fill (sand) that presumably had been hauled from the beach at Tlell. At Rose Spit it is the dominant species on sand flats with *Tanacetum huronense* Nutt. and *Poa douglasii* ssp. *macrantha* (Vasey) Keck. We surveyed almost the entire east and west coasts of Moresby Island either by air or by boat and the only suitable habitat noted for this species was the extensive sand beach at Woodruff Bay near Cape St. James. However, no plants were found in a brief survey of this beach in August 1964. The only other area where *C. macrocephala* might occur on the Charlottes is between Frederick and Langara islands, where there are a number of sand beaches. This species usually occurs in pure stands in sparsely vegetated areas where its deep-seated, long-creeping rhizomes help to stabilize drifting sand.

153. Carex macrochaeta C. A. Meyer, Mém. Acad. St .Pétersb. Sav. Étr. 1: 224. *pl.* 13. 1831.

GRAHAM ISLAND: between Ells and Mercer pts., *CST22887;* Shields Bay, *CT23311;* Jalun Lake, *CT35642;* Long Inlet, *CT35983;* Skidegate, June 1901, *Newcombe* (V); Dawson Harbour, June 24, 1897, *Newcombe* (CAN).

MORESBY ISLAND: Newcombe Peak, *CST22040;* Echo Harbour, *CST22381;* Takakia Lake, *CST23110, CT36269;* Mt. de la Touche, *CT23535;* between Cumshewa and Peel inlets, *CT35204;* Mt. Russ, *CT36148;* Kaisun, *CT36563;* Sunday Inlet, *CT36618*.

There is little difficulty in the identification of the montane *C. macrochaeta* in the main part of its range along the Alaska coast, in the Queen Charlotte Islands, and on the adjacent mainland, but no conclusions have been reached as to the disposition of collections from the southern part of the province that appear to be intergrades with the closely related *C. spectabilis* Dewey. Typical *C. macrochaeta* can readily be distinguished from all other *Carex* on the Charlottes by the conspicuously aristate scales of the pistillate spikes and its brushlike staminate spikes with long, protruding, flexuous filaments. It is a coastal species in the northern part of its range but to the south there are a few inland records. Although Mackenzie (1935, p. 353) only saw material of *C. macrochaeta* from Alaska, Yukon, and Vancouver, he extended its range to Oregon by including Piper's report (1915, p. 78) of this species from Multnomah Falls. This latter collection needs to be examined, for it is quite unlikely that it should be referred to *C. macrochaeta.*

The text of *Carex* in the *Illustrated Flora of the Pacific States* was contributed by Mackenzie, who placed *C. macrochaeta* next to *C. spectabilis* in the sect. *Atratae* Kunth. Later in 1935 in *North American Flora* he transferred it to the sect. *Limosae* Tuckerm., but in our view this species is not closely related to the members of this section and should be left in the sect. *Atratae.*

A number of infraspecific taxa have been proposed for *C. macrochaeta*: var. *emarginata* Holm and var. *macrochlaena* Holm from Alaska; and ssp. *flavocuspis* Franch. & Sav. with its varieties *denticulata* Kük. and *platycarpa* Kük. from Japan. All have been placed in the synonymy of *C. macrochaeta,* referred to other species, or considered as hybrids. We have seen no material of any of these entities. *C. macrochaeta* hybridizes with *C. mertensii* Prescott in the Skeena River valley (*Calder et al. 14937*) and probably with such species as *C. nesophila* Holm along the Alaska coast.

Carex macrochaeta is common on cliffs and in rocky runnels at or near tree line in the Queen Charlotte ranges. It descends almost to sea level on exposed rocky habitats on the west coast. The Newcombe collection labeled Skidegate is probably from the mountains about eight miles northwest of the townsite.

154. Carex mertensii Prescott in Bong., Mém. Acad. St. Pétersb. VI. 2: 168. 1832.

GRAHAM ISLAND: about 3½ mi S of Masset, *CST21278;* McClinton Bay, *CST21680;* Langara Island, *CST22540;* Tow Hill, *CST22740;* Dawson Inlet, *CST22827;* Shields Bay, *CT23307;* Jungle Beach, *CST23388;* near Tlell, *CST23495;* about 6 mi N of Skidegate, *CST23686* (DAOM); near Juskatla, *S3507, CT35554;* Yakoun Lake, *CT36773;* near junction of Yakoun River and Ghost Creek, *CT35511;* Tlell River, July 14, 1914, *Green* (UBC).

MORESBY ISLAND: about 3 mi S of mouth of Copper Creek, *CST-21896;* Bigsby Inlet, *CST22157;* Mt. de la Touche, *CT23536;* mouth of Deena River, *CT23775;* Kaisun, *CT36539;* Chaatl Village, July 20, 1910, *Spreadborough* (CAN).

We recognize only two subspecies in *C. mertensii*. All North American collections belong to the typical phase, which has awnless or minutely awned pistillate scales. In contrast, the essentially Japanese ssp. *urostachys* (Franchet) Calder & Koyama has awns ranging from about 1 to 2 mm in length. There are also other minor differences between the two subspecies, such as the length of the lowest bracts of the inflorescences and the shape of the pistillate scales.

Carex mertensii is common throughout the lowlands of eastern Graham and northeastern Moresby islands and at low elevations in the Queen Charlotte Ranges. It grows in a wide variety of habitats and can tolerate the densely shaded conditions of the climax spruce–hemlock forest, where it usually occurs along stream banks or along the margins of ravines where the competition is not too severe. In the Queen Charlotte Ranges it is found in runnels and rocky openings on forested slopes below 500 ft. It produces abundant seed and has become well established along roadsides and in logged-over woods.

155. Carex nigricans C. A. Meyer, Mém. Acad. St. Pétersb. Sav. Étr. 1: 211. *pl.* 7. 1831.

GRAHAM ISLAND: Tan Mtn., *CST21618;* Shields Bay, *CT23286, CT23358.*

MORESBY ISLAND: Newcombe Peak, *CST22028;* Echo Harbour, *CST22341;* Takakia Lake, *CST23131, CT36286;* Mosquito Mtn., *CT23708.*

Carex nigricans, a remarkably uniform species, is common in the Coast Mountains along the British Columbia – Alaska coast. South of 54°N it extends inland to the eastern flank of the Rocky Mountains.

This species is one of the most common sedges of meadows and open heath slopes in the Queen Charlotte Ranges. It extends well below tree line in boggy habitats on open-wooded ridges and in rocky ravines.

156. Carex obnupta Bailey, Proc. Calif. Acad. II. 3: 104. 1891.
C. magnifica Dewey in Holm, Amer. J. Sci. IV. 17: 316. 1904.

GRAHAM ISLAND: 2½ and 4½ mi E of Masset, *CT35608, CST-21134;* near mouth of Sangan River, *CST21153;* Mercer Lake, *CS21490;* McClinton Bay, *CST21640;* Langara Island, *CST22530;* Lepas Bay, *CST-22615;* Tow Hill, *CST22677;* Tlell, *CST23160,* June 2, 1951, *Cowan* (UBC); Yakoun River Delta, *CST23503;* 9 mi S of Juskatla, *T70;* Collinson Lake, *CT35515;* 2 mi NW of Tlell, *CT35689;* near mouth of Oeanda River, *CT-35884;* near Pure Lake, *CT36094;* Yakoun Lake, *CT36760;* Masset, July 1914, *Green* (UBC); near Skidegate, July 16, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: 2½ mi SW of Sandspit, *CST21084;* Skidegate Lake Bridge, *CST21953;* Bag Harbour, *CST22189;* islet off Bolkus Islands, *CST22234;* Skedans Islands, *CST22386;* South Low Island, *CTS34839;* Tuft

Islets, *CTS34874;* E end of Skidegate Lake, *CT35263;* Red Mud Marsh, *CT35360;* Upper Victoria Lake, *CT35754,* Tasu Sound, June 2, 1901, *Newcombe* (V).

Carex obnupta is one of the most common and widely distributed lowland sedges on the Queen Charlotte Islands. At the coast it is found in meadows and along the upper limits of sea beaches, but it is rarely a dominant element of the vegetation like the more salt-tolerant *C. lyngbyei* Hornem. that forms extensive stands to the exclusion of other halophytic species. Inland, *C. obnupta* occurs in fresh-water habitats especially in marshes, bogs, and along lakeshores and rivers. We have seen no collections from north of the Charlottes, although Mackenzie (1935, p. 420) states that it has been reported from southern Alaska.

157. Carex pauciflora Lightf., Fl. Scot. 2: 543. *pl.* 6. 1777.

GRAHAM ISLAND: 3½ mi NW of Tlell, *CST20943;* 7½ mi S of Masset, *CST21257;* about 3 mi SW of Tow Hill, *CST21333;* Empire Anchorage, *CS21472;* Tan Mtn., *CST21626;* Langara Island, *CST22491;* Newton Pt., *CST22989;* Shields Bay, *CT23276;* about 9 mi S of Juskatla, *T66;* 3 mi E of Juskatla, *CTS35045;* Dawson Inlet, *CTS35105;* Jalun Lake, *CT35660;* Pure Lake, *CT36097;* Skidegate, Aug. 2, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: Chaatl Narrows, *CST21747;* head of Cumshewa Inlet, *CST22032;* Bigsby Inlet, *CST22125;* Anna Inlet, *CTS34975.*

Carex pauciflora occurs in many bogs along the mainland British Columbia coast and on Vancouver Island, but is rare inland except where there are extensive open muskegs between and north of Prince George and Smithers. At the coast this species extends northward to the Gulf of Alaska.

On the Queen Charlotte Islands it is one of the most common and widely distributed bog sedges. It was noted in all the many lowland sphagnum bogs of eastern Graham Island that were carefully surveyed and was found on open boggy slopes of the Queen Charlotte Ranges from near sea level to tree line.

158. Carex phyllomanica W. Boott in S. Wats., Bot. Calif. 2: 233. 1880.

GRAHAM ISLAND: near Tow Hill, *CST21290, CST22732;* near Skidegate Village, *CST21694;* 3 mi N of Lawnhill, *CST21730;* about 3 mi NW of Tlell, *CST22075, CST23477;* Langara Island, *CST22489;* between Ells and Mercer pts., *CST22869;* Newton Pt., *CST22991;* about 3 mi N of Port Clements, *T144;* 3 mi E of Juskatla, *CTS35049;* Jalun Lake, *CT35659;* 4 mi N of mouth of Oeanda River, *CT35858;* Yakoun Lake, *CT36774,* Aug. 1895, *Newcombe* (V).

MORESBY ISLAND: Chaatl Narrows, *CST21774A & B;* White Swan Bog, *CST21943;* Skidegate Lake, *CST21954;* Red Mud Marsh, *CST22057;*

Bigsby Inlet, *CST22124;* Echo Harbour, *CST22345, CST22370;* Mt. de la Touche, *CT23534;* Mosquito Mtn., *CT23729;* between Cumshewa and Peel inlets, *CT35190;* Upper Victoria Lake, *CT35752;* Kootenay Inlet, *CT36177;* Sunday Inlet, *CT36589;* Yakulanas Bay, *CT36654.*

Carex phyllomanica, one of the most distinct species in the sect. *Stellulatae* Kunth, is probably most closely related to the variable *C. omiana* Franch. & Sav. of Japan. Mackenzie (1931, p. 99-114) recognized 20 species in his treatment of the *Stellulatae* in *North American Flora,* but many of them are poorly defined and the section is in need of a thorough revision.

Carex phyllomanica is strictly a coastal species ranging from the Kenai Peninsula in Alaska south to California. On the Charlottes it is common in lowland bogs and marshes and extends to at least 1,500 ft on exposed or open-wooded boggy slopes of the Queen Charlotte Ranges.

159. Carex physocarpa Presl, Rel. Haenk. 1: 205. 1828.
C. saxatilis var. *major* Olney in S. Wats., Bot. King's Expl. 370. 1871.

GRAHAM ISLAND: Yakan Pt., *CST21321A;* between Tow Hill and Rose Spit, *CST22754;* Jalun Lake, *CT35657;* Yakoun Lake, *CT36787.*

MORESBY ISLAND: Echo Harbour, *CST22344, CST22383;* Takakia Lake, *CST23133;* Mosquito Mtn., *CT23698;* Anna Lake, *CTS34974;* Red Mud Marsh, *CT35369;* Upper Victoria Lake, *CT35753;* Kootenay Inlet, *CT36178;* Mosquito Lake, *CT36707.*

The taxonomic disposition of the distigmatic *C. saxatilis* L., *C. miliaris* Michx., and *C. physocarpa* Presl of the sect. *Vesicariae* has long been a source of confusion to North American and European botanists. O'Neill and Duman (1941) in a study of this complex recognized a single species, *C. saxatilis,* and they considered the North American population to be comprised of two races, var. *miliaris* (Michx.) Bailey and var. *major* Olney (=*C. physocarpa*). Where these two varieties meet in the Hudson Bay region they form a broad zone of intergradation. Examination of some 80 collections in this institute from Alaska, British Columbia, Yukon, and western Alberta reveals an extremely uniform and homogeneous population that is clearly distinct from *C. miliaris* of eastern North America. We are tentatively regarding this essentially western North American element as a distinct species, *C. physocarpa.*

Carex physocarpa probably occurs throughout the Queen Charlotte Islands in spite of the few records. It grows at the margins of bog pools and along lakeshores in the lowlands and is found in similar habitats from sea level to tree line in the Queen Charlotte Ranges.

160. Carex pluriflora Hult., Fl. Alaska & Yukon 2: 367. *Fig.* 4, a-d. 1942.
C. stygia E. M. Fries, Nov. Fl. Suec. Mant. 3: 141. 1842, *sensu* Amer. auth.

GRAHAM ISLAND: 3½ mi NW of Tlell, *CST20941;* near Tow Hill, *CST21173;* 1½, 6, and 8 mi SE of Port Clements, *CST21256, CST22823* (DAOM), *CST22092;* Yakan Pt., *CST21321;* McClinton Bay, *CST21572;*

near Skidegate, *CST21693,* July 16 and Aug. 12, 1910, *Spreadborough* (CAN); Langara Island, *CST22505;* between Tow Hill and Rose Spit, *CST-22753;* Shields Bay, *CT23287;* about 9 mi S of Juskatla, *T65;* 7 mi N of Port Clements, *CTS34701;* 3 mi E of Juskatla, *CTS35047;* about 2 mi S of Rose Spit, *CT35911A;* Jalun Lake, *CT35658;* Naden Harbour, *CT36859;* Juskatla, June 7, 1952, *Schmidt;* Masset, Sept. 28, 1912, *Green* (UBC).

MORESBY ISLAND: White Swan Bog, *CST21030, CST21936* (DAOM); Bag Harbour, *CST22190;* Echo Harbour, *CST22371;* Red Mud Marsh, *CT35370;* Kootenay Inlet, *CT36173;* Rose Inlet, *CT36993;* Canoe Pass, June 1897, *Newcombe* (V).

Mackenzie (1935) in his treatment of *Carex* for *North American Flora* distinguished *C. pluriflora* (=*C. stygia*) from the closely related *C. rariflora* (Wahlenb.) Smith as follows:

Perigynia 4-4.5 mm long, tapering at apex; achenes broadly obovoid; pistillate scales broadly ovate; culms sharply triangular, not stiff; pistillate spikes usually 10- to 25-flowered ..... *C. pluriflora*

Perigynia 3-3.5 mm long, round-tapering at apex; achenes elliptic; pistillate scales broadly ovate to suborbicular; culms obtusely triangular, stiff; pistillate spikes usually 2- to 10-flowered ..... *C. rariflora*

The key characters used by Mackenzie for separating the two species are not entirely reliable when a large series of specimens is examined. The Queen Charlotte Island material has perigynia ranging from 3.4 to 4.2 mm in length with the beaks either "round-tapering" or "tapering" at the apex (Mackenzie, 1940, *pl.* 404, 405); the achenes are broadly obovoid, the culms are stiff and vary from obtusely to sharply triangular, and the pistillate spikes are usually more than 8-flowered. In *C. rariflora* the perigynia rarely exceed 3.2 mm in length and the beak is "round-tapering," the achenes vary from ellipsoid to broadly obovoid, the culms are stiff and usually sharply triangular, and the pistillate spikes are usually less than 8-flowered. The length of the perigynia and the number of flowers per spike are the only reliable key characters proposed by Mackenzie for separating the two species. However, *C. pluriflora* is a taller and a more robust plant in all its parts than *C. rariflora.* Furthermore, the spikes of *C. pluriflora* are longer and broader, the perigynia are more strongly nerved, and the more conspicuously mucronate scales lack a conspicuous midvein and are darker, ranging from brownish black to black.

Carex pluriflora extends from northern Washington along the British Columbia coast to the Gulf of Alaska and westward to the Aleutian and Commander islands. Throughout almost all its range it is isolated from *C. rariflora,* which occurs along the Arctic slope, in the Bering Strait region, and from isolated stations in the interior of Alaska. We have seen a collection from Nome (*Lepage 23844*) that appears to be a hybrid between the two species and it is likely there is considerable introgression along the Bering Sea coast where the

two species meet. As pointed out by Hultén, the name *C. stygia* must be rejected for the Pacific coast plant.

Carex pluriflora is essentially a species of sphagnum bogs and sedge meadows and occurs throughout the lowlands of Graham and Moresby islands. It will tolerate slightly saline conditions and is occasionally found along the upper limits of protected sea beaches and in boggy tidal meadows. It is rare at high elevations and was noted only once in the Queen Charlotte Ranges.

161. Carex pyrenaica Wahlenb. ssp. **micropoda** (C. A. Meyer) Hult., Fl. Alaska & Yukon 2: 308. 1942.

C. micropoda C. A. Meyer, Mém. Acad. St. Pétersb. Sav. Étr. 1: 210. *pl.* 6. 1831.

MORESBY ISLAND: Mt. de la Touche, *CT23533;* Takakia Lake, *CT-36270;* Mt. Moresby, *CT36497.*

Carex pyrenaica occurs in three disjunct areas in the Old World: the Pyrenees, the Caucasus, and the mountains of Hungary, Bulgaria, and Roumania. The exact relationship of these disjunct populations to the North American – eastern Asiatic *C. pyrenaica* Wahlenb. and its segregate, ssp. *micropoda,* is still obscure and will remain so until collections from each of these areas are carefully compared. We have seen a few collections from the Pyrenees, Hungary, and Japan, and some 70 numbers from North America, most of which have been collected in British Columbia, Yukon, and Alaska over the past 15 years by members of the Plant Research Institute.

Mackenzie (1931, p. 26-28) in his treatment of *Carex* sect. *Callistachys* (Heuffel) Asch. & Graebn. for North America distinguished *C. pyrenaica* from *C. micropoda* as follows:

Stigmas normally three; perigynia 3-4 mm long; leaves 4 to a fertile culm, the blades 0.25-1.5 mm wide, strongly channeled ..... *C. pyrenaica*

Stigmas always two; perigynia 2.25-3 mm long; leaves 4-8 to a fertile culm, the blades 1.25-2 mm wide, flat above ..... *C. micropoda*

Although Mackenzie recognized these entities as species we can find no clear line of distinction between the essentially tristigmatic *C. pyrenaica* and the distigmatic *C. micropoda.* We consider the latter to be a recognizable taxon, but only as a weak coastal race that extends from the Queen Charlotte Islands through the Aleutian chain to the Kuriles north of Japan. The few collections that we have seen from the Japanese islands of Hokkaido and Honshu are tristigmatic and are similar to plants from interior and southern British Columbia. In North America the widely distributed southern and continental race, ssp. *pyrenaica,* extends from Oregon and Colorado northward through British Columbia to the interior regions of Alaska and Yukon. Throughout this region it is extremely variable as to stature, width and length of leaves, and shape, size, and color of spikes, perigynia, pistillate scales, and achenes. The distinguishing leaf characters emphasized by Mackenzie are entirely unreliable.

We have seen many plants from interior and southern British Columbia that have both distigmatic and tristigmatic perigynia in the same spike or collection and obviously the number of stigmas by itself is of little value in separating the two subspecies. But if stigma number is combined with the shape of perigynia the coastal distigmatic ssp. *micropoda* can be distinguished from distigmatic or tristigmatic ssp. *pyrenaica* by shorter and broader ovoid perigynia. The two collections of ssp. *pyrenaica* we have seen from the type area in the Pyrenees have extremely narrow perigynia that are strongly reflexed or divergent at maturity. Although we are referring the wide-ranging plant of North America to the typical phase, it may eventually have to be treated as distinct from the European race.

Carex pyrenaica ssp. *micropoda* is apparently rare on the Queen Charlotte Islands. It was only found below steep rock cliffs at about 2,000 ft near the summit of Mount de la Touche, in the east col about 750 ft above our campsite at Takakia Lake, and on a rocky beach at the margin of a steep runnel below the north face of Mount Moresby.

162. Carex scirpoidea Michx., Fl. Bor.-Amer. 2: 171. 1803.

GRAHAM ISLAND: between Ells and Mercer pts., *CST22870.*

MORESBY ISLAND: Echo Harbour, *CST22358;* Mosquito Mtn., *CT-23693;* Takakia Lake, *CT36292;* Mt. Moresby, *CT36444.*

We have examined a large number of *Carex* collections of the sect. *Scirpinae* Tuckerm., but have been unable to reach a decision as to the number of segregates that should be recognized. Mackenzie (1935, p. 206-210) in his treatment of *Carex* in *North American Flora* recognized six species in the *Scirpinae*: *C. gigas* (Holm) Mackenzie, *C. pseudoscirpoidea* Rydb., *C. scabriuscula* Mackenzie, *C. scirpiformis* Mackenzie, *C. scirpoidea* Michx., and *C. stenochlaena* (Holm) Mackenzie. Kükenthal (1909, p. 81), on the other hand, recognized only a single species in the section, *C. scirpoidea,* with four varieties. In addition to the species already mentioned there is the recently described *C. athabascensis* Hermann, which we have collected at the type locality in Jasper National Park in Alberta. Although we have arrived at no conclusion as to the number of segregates of *C. scirpoidea* that should be recognized, we concur with Kükenthal in the recognition of but a single species in the section.

Only two taxa in the *Scirpinae, C. scirpoidea* and *C. stenochlaena,* have been reported from Alaska and western British Columbia. The differences between them are stated to be in the shape and length of the perigynia and whether they have short- or long-stipitate achenes. The perigynia of *C. stenochlaena* are described by Mackenzie as being flattish, lanceolate, or oblanceolate, and 3.5 to 4 mm long with achenes slenderly stipitate. In contrast he described the perigynia of *C. scirpoidea* as ovoid or oblong-ovoid, compressed triangular, and 2.5 to 3 mm long with short-stipitate achenes. Plants of both types and intermediates are found in the Pacific Northwest and until a thorough study is completed of the entire complex we prefer to treat the collections from

the Queen Charlotte Islands and Alaska – British Columbia coast as *C. scirpoidea* in the broad sense.

On the Queen Charlotte Islands this species is restricted to the mountainous regions of Graham and Moresby islands. It occurs on cliffs, rocky slopes, and knolls in the alpine zone and extends almost to sea level on rocky outcrops in open exposed situations on the west coast.

163. Carex sitchensis Prescott in Bong., Mém. Acad. St. Pétersb. VI. 2: 169. 1832.

C. aquatilis var. *sitchensis* (Prescott) Kelso, Biol. Leafl. 66: 38. 1953.

GRAHAM ISLAND: about 7 mi SE of Port Clements, *CST22084;* Langara Island, *CST22490;* about 2 mi E of Tow Hill, *CST22735;* Jalun Lake, *CT35619, CT35666.*

MORESBY ISLAND: Skidegate Lake Bridge, *CST21955;* between Skidegate Lake and Copper Bay, *CT35257;* east end of Skidegate Lake, *CT35269.*

There is no problem in distinguishing the *C. sitchensis* population of the Coast and Cascade mountains, but in interior British Columbia it is found in the same region as the polymorphic *C. aquatilis* Wahlenb. and intermediates occur. These two closely related species belong to the sect. *Acutae* Fries, which, in North America, is comprised of a group of extremely plastic species that exhibit a wide range of morphological variation. Of these species, *C. aquatilis* is probably the most variable. Kelso (1953) in a treatment of *Carex* for Colorado considered *C. sitchensis* to be a variety of *C. aquatilis.* The small series of *C. aquatilis* from Colorado in our institute includes four collections by Kelso, which he determined as var. *sitchensis.* Unfortunately he misinterpreted this species, for none of these collections are *C. sitchensis.* They should be referred to *C. aquatilis sensu stricto* or one of its many varieties. Although introgression occurs where *C. aquatilis* and *C. sitchensis* meet, their ranges are essentially distinct and we believe they should be maintained as separate species. We have not seen any collections of the former from west of the Coast Mountains, where *C. sitchensis* attains its maximum development.

Carex sitchensis occurs in marshes and bogs along the Alaska – British Columbia coast as far north as the Kenai Peninsula. In the northern part of its range it is strictly a coastal species, but south of about 55°N it extends inland to the west flank of the Rocky Mountains. It is poorly represented in our collections from the Queen Charlotte Islands and is probably much more widely distributed in lowland marshes and bogs than indicated by the few scattered records.

164. Carex stylosa C. A. Meyer, Mém. Acad. St. Pétersb. Sav. Étr. 1: 222, *pl.* 12. 1831.

GRAHAM ISLAND: 3 mi SW of Tow Hill, *CST21327;* Tan Mtn., *CST-21619;* 7 mi SE of Port Clements, *CST22082;* Newton Pt., *CST22975;* Shields

Bay, *CT23289;* 12 mi N of Port Clements, *CTS34718;* 15 mi S of Masset, *CT35564;* Jalun Lake, *CT35680;* 5 mi W of Tlell, May 27, 1951, *Cowan* (UBC).

MORESBY ISLAND: Chaatl Narrows, *CST21746;* Newcombe Peak, *CST22026;* Bigsby Inlet, *CST22165, CTS34894;* Takakia Lake, *CST23141; CT36344;* Upper Victoria Lake, *CT35751;* Chaatl Island, July 11, 1962, *Schofield* (UBC).

In western North America *C. stylosa* is restricted to the coastal regions of British Columbia and Alaska. The only records from British Columbia are from mainland Coast Mountains adjacent to the Queen Charlotte Islands, from Hollyburn plateau just north of Vancouver, from central Vancouver Island, and from Hope Island at the entrance to Queen Charlotte Strait. In spite of the few records, its distribution is probably continuous along the coast. The most easterly penetration of *C. stylosa* is in the Skeena River drainage, where it is known from Mount Thornhill a few miles south of Terrace. Hultén (1943*b*) and Raymond (1949) have discussed in detail the distribution and taxonomy of this species.

Carex stylosa is common throughout the Queen Charlotte Ranges from alpine summits down almost to sea level in exposed situations on the west coast. It is often a conspicuous element of the vegetation and forms dense round tussocks on open boggy slopes, in alpine meadows, and on heathy ridges above tree line. There are also a number of records from the sedge meadows and sphagnum bogs of the lowlands of eastern Graham Island.

165. Carex tracyi Mackenzie, Erythea 8: 41. 1922.

GRAHAM ISLAND: near Yakoun River Delta, *CST23508, CT35465;* Yakoun River about 4½ mi S of Port Clements, *CT35563.*

Carex tracyi, a species of wet meadows and low marshy ground, has been collected a number of times along the east coast of southern Vancouver Island and on the adjacent mainland. The records from the Queen Charlotte Islands represent a considerable range extension northward. It was found only in marshy ground in an opening in the dense coniferous forest along the trail from Port Clements to Yakoun River Delta and in disturbed roadside habitats a few miles south of Port Clements along the road to Juskatla.

166. Carex viridula Michx., Fl. Bor.-Amer. 2: 170. 1803.
C. oederi var. *viridula* (Michx.) Kük., Pflanzenreich IV. 38. 674. 1909.

GRAHAM ISLAND: about 2 and 3½ mi E of Tow Hill, *CST21289, CST22734A;* near mouth of Oeanda River, *CT35905;* Yakoun Lake, *CT-36761;* north of Skidegate, July 16, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: Red Mud Marsh, *CST22055, CST23194* (DAOM); E end of Skidegate Lake, *CST23628, CT35262;* Mosquito Lake,

CT23655; Upper Victoria Lake, *CT35758;* Kootenay Inlet, *CT36174;* Chaatl Island, July 10, 1962, *Schofield* (UBC).

The sect. *Spirostachyae* Drejer (=*Extensae* Fries) to which *C. viridula* belongs is best developed in North America in coastal habitats around the Gulf of St. Lawrence. The members of this section comprise a complex taxonomic group and there is still little agreement as to how the North American members should be treated. The center of complexity of the *Spirostachyae* is in Europe and until the Old and New World species are critically compared we are referring all plants from the Pacific Northwest that have small perigynia with short beaks to *C. viridula.*

Carex viridula occurs throughout the Charlottes in lowland habitats, but is rare in the Queen Charlotte Ranges. It is found in sedge marshes and bogs, and on lakeshores in sand or gravel.

Eleocharis

Styles trifid; achenes trigonous; culms capillary ..... *E. acicularis*
Styles bifid; achenes lenticular; culms never capillary
  Plants caespitose ..... *E. obtusa*
  Plants rhizomatous
    Spikelets with a single basal scale that completely encircles top of culm; tubercles rounded at the apex, spongy, about half as large to as large as body of achene ..... *E. kamtschatica*
    Spikelets with two or three basal scales each encircling part of top of culm; tubercles pyramidal, hard, much smaller than body of achene *E. macrostachya*

167. Eleocharis acicularis (L.) R. & S., Syst. Veg. 2: 154. 1817.

MORESBY ISLAND: Skidegate Lake, *CT36065.*

On the Queen Charlotte Islands *E. acicularis* is another in a group of species that includes *Carex arcta* Boott and *Lycopus uniflorus* Michx., that was only found along the shorelines of Skidegate Lake. This species was collected on mud flats near the bridge that spans the lake and was growing in association with *Eleocharis obtusa* (Willd.) Schult., *Juncus oreganus* S. Wats. and *Equisetum palustre* L.

168. Eleocharis kamtschatica (C. A. Meyer) Komarov, Fl. Penins. Kamtsch. 1: 207. 1927.

GRAHAM ISLAND: About 2½ mi E of Tow Hill, *CST22737;* near mouth of Oeanda River, *CT35906.*

This distinctive, large-tubercled species of *Eleocharis* is at the southern limit of its range in western North America on the Queen Charlotte Islands. It

was only found in a boggy meadow about two miles east of Tow Hill and on the grassy margins of a slough on extensive sand flats near the mouth of the Oeanda River on the north and east coasts of Graham Island respectively. At the time Hultén (1942, p. 291) wrote his *Flora of Alaska and Yukon* there were only a few scattered records of *E. kamtschatica* from along the Alaska coast, however it is probably much more widely distributed for we have seen collections from Anchorage and Hyder, and from Hope, Seward, and Homer in the Kenai Peninsula.

169. Eleocharis macrostachya Britt. in Small. Fl. SE. U.S. 184, 1327. 1903.
E. palustris sensu Henry, Fl. South. B.C. 74. 1915.

GRAHAM ISLAND: about 2 mi W of Tow Hill, *CST22720;* Masset, *CST22802;* Tlell, *CST23155, CTS34659;* 3 mi NW of Tlell, *CST23471;* near mouth of Oeanda River, *CT35883;* Yakoun Lake, *CT36752;* about 2 mi S of Masset, *CT36912.*

MORESBY ISLAND: about 3 mi S of mouth of Copper Creek, *CST-21894;* White Swan Bog, *CT23666.*

In 1947 Svenson discussed the relationships of the North American species in the circumboreal *E. palustris* complex and came to the conclusion that, with the exception of *E. kamtschatica* (C. A. Meyer) Komarov, all plants of this complex should be referred to *E. macrostachya.* This latter species is extremely variable and although we are following Svenson's treatment we are not convinced that it should be considered distinct from *E. palustris* at specific rank.

On the Queen Charlotte Islands *E. macrostachya* is apparently restricted to the lowlands of eastern Graham and Moresby islands, where it occurs in marshes, in sedge meadows, along creek banks, and around the margins of bog pools.

170. Eleocharis obtusa (Willd.) Schultes, Syst. Nat. Mant. 2: 89. 1824.

MORESBY ISLAND: Skidegate Lake, *CT36063, CT36733.*

Eleocharis obtusa, a rare species on the Queen Charlotte Islands, is represented by two collections from mud flats near the bridge that spans Skidegate Lake. It was growing a short distance back from the shoreline in association with *Eleocharis acicularis* (L.) R. & S., *Carex arcta* Boott, *Carex exsiccata* L. H. Bailey, *Juncus oreganus* S. Wats., and *Equisetum palustre* L. This record represents the northern limit of *E. obtusa* along the northwest Pacific coast.

Eriophorum

Spikelets solitary, without a leafy involucre ..... *E. chamissonis*
Spikelets more than one, with a leafy involucre of one or more foliaceous bracts ..... *E. angustifolium*

171. Eriophorum angustifolium Honck., Verz. Gew. Teutschl. 1: 153. 1782.

GRAHAM ISLAND: about 3½ mi NW of Tlell, *CST20942, CT35454;* near Tow Hill, *CST21162;* 7½ mi S of Masset, *CST21255;* Empire Anchorage, *CS21471;* Tan Mtn., *CST21603;* Langara Island, *CST22510;* Shields Bay, *CT23318;* about 5 mi SE of Port Clements, *CST23483* (DAOM); about 9 and 10 mi SSE of Juskatla, *T62, T14;* 3 mi E of Juskatla, *CTS35051;* Jalun Lake, *CT35664;* N of Queen Charlotte City, July 5, 1952, *Schmidt;* Yakoun Lake, Aug. 1895, *Newcombe* (V); MacIntosh Meadows, May 28, 1951, Cowan (UBC).

MORESBY ISLAND: Chaatl Narrows, *CST21773;* Bigsby Inlet, *CST-22164;* Takakia Lake, *CST23134;* Anna Inlet, *CTS34970;* Upper Victoria Lake, *CT35786;* Mike Inlet, *CT36667.*

Hultén (1962, p. 58) recently interpreted the *E. angustifolium* complex as being comprised of at least four subspecies, but he made little attempt to compare the entities recognized. All the collections from the Queen Charlotte Islands have rather narrow leaves and usually scabrous peduncles and would be referred by Hultén to ssp. *scabriusculum* Hult. There is, however, so much variation in plant size, leaf width, the number and disposition of the spikelets, the color and shape of the scales, and peduncle types in North American material that only a detailed study on a worldwide basis will straighten out the taxonomy in this complex.

Eriophorum angustifolium is common throughout the Queen Charlotte Islands. It was collected or noted in all the lowland bogs that we surveyed and occurred to tree line on open boggy slopes in the Queen Charlotte Ranges.

172a. Eriophorum chamissonis C. A. Meyer ex Ledeb., Fl. Altaica 1: 70. 1829. **Figure 58.**

E. medium sensu Hult., Fl. Alaska & Yukon 2: 281. 1942.

GRAHAM ISLAND: about 8 mi SE of Port Clements, *CST21358;* Langara Island, *CST22511;* near Tow Hill, *CST22726, CST22756;* Mamin River Delta, *T124;* 4 mi NW of Tlell, *CT35457;* Jalun Lake, *CT35663;* about 4 mi N of mouth of Oeanda River, *CT35855;* Juskatla, June 17, 1952, *Schmidt;* N of Skidegate, July 16, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: White Swan Bog, *CST21938;* between Aero and Moresby logging camps, *CT35292.*

172b. Eriophorum chamissonis × Eriophorum russeolum

GRAHAM ISLAND: Masset, *CST20857;* 3½ mi NW of Tlell, *CST-20947;* near Tow Hill, *CST21163;* between Tow Hill and Rose Spit, *CST-21225;* Yakan Pt., *CST21322;* near Skidegate Village, *CST21704;* MacIntosh Meadows, May 28, 1951, *Cowan* (UBC).

MORESBY ISLAND: White Swan Bog, *CST21035.*

Over much of their ranges *E. chamissonis* and *E. russeolum* Fries are most distinct, but where they occur together along the Alaska coast there is often no clear line of demarcation between the two species. The latter is not present in the Queen Charlotte Islands nor has it been recorded from mainland British Columbia, but we believe that many of the plants found in the lowland bogs of the Charlottes are of hybrid origin. On our return to the Islands in 1964 we carefully reexamined many of the bog populations and confirmed our opinion that only *E. chamissonis* and a number of collections that are intermediate between this species and *E. russeolum* are present. *Eriophorum chamissonis* is a robust plant with thickish culms and globose heads with brown bristles and conspicuous basal scales. The hybrid populations comprised plants with usually more delicate culms and globose to obovoid heads that have slightly tawny to white bristles and either inconspicuous or conspicuous basal scales. *Eriophorum chamissonis* is common in bogs throughout central British Columbia, but is rare in the southern part of the province east of the Coast Mountains where there are few suitable habitats. On Vancouver Island it is the only single-spiked species. We are following the detailed treatment of Raymond (1954) for the *E. chamissonis* – *E. russeolum* complex, but we believe the single-headed species of this genus still present many problems. There is still little unanimity of opinion as to how a number of the entities should be treated.

In the Queen Charlottes both *E. chamissonis* and the hybrid population are restricted to lowland bogs and their distributions are essentially sympatric. *Eriophorum chamissonis* flowers two to three weeks later than the hybrid.

Rhynchospora

173. Rhynchospora alba (L.) Vahl, Enum. Pl. 2: 236. 1806.

GRAHAM ISLAND: about 10 mi S of Masset, *CST22816;* Newton Pt., *CST22990;* about 3 mi NW of Tlell, *CST23491.*

MORESBY ISLAND: Bigsby Inlet, *CST22176;* Upper Victoria Lake, *CT35738;* Kootenay Inlet, *CT36137;* Sunday Inlet, *CT36593.*

Rhynchospora alba occurs in bogs along the northwest Pacific coast from Sonoma County, California, to the Alaska panhandle, and there is an isolated disjunct station (*Dutilly et al. 21937*) near Anchorage, over 500 miles to the northwest. We do not know of any records for British Columbia from east of the Coast Mountains. Gale (1944, p. 120) in a monograph of *Rhynchospora* records only a single collection of this species from the Prairie Provinces of Western Canada, but in recent years a few new stations have been located in Saskatchewan, and Hultén (1958, map 249) records a single locality for Alberta. There are still no records from Manitoba, but on phytogeographic grounds it would be most surprising if this species is not eventually found in the province.

Rhynchospora alba is common in lowland sphagnum bogs and on open-wooded, boggy mountain slopes throughout the Queen Charlotte Islands. It is a

late-flowering species and this accounts for the relatively few records. It was noted many times on both the 1957 and 1964 surveys, and even in mid-August, prior to our departure, many plants had not yet reached anthesis.

Scirpus

Leaves with flat elongate blades; involucres of several leaflike bracts
- Plants stoloniferous; floral scales blackish green; perianth bristles at maturity shorter than the scales and thus the spikelets not appearing woolly ..... *S. sylvaticus*
- Plants tufted; floral scales brownish; perianth bristles at maturity longer than the scales and thus the spikelets appearing woolly ..... *S. atrocinctus*

Leaves reduced to bladeless or nearly bladeless sheaths; involucres not as above
- Inflorescence a corymb with many spikelets; tall plants, as much as 30 cm high ..... *S. lacustris*
- Inflorescence a single terminal spike; small plants, less than 30 cm high
  - Plants annual; basal sheaths about 2, pale green and sanguineous tinged; spikes pseudolateral; achenes pebbled ..... *S. cernuus*
  - Plants perennial; basal sheaths many, light-brown; spikes terminal; achenes smooth ..... *S. cespitosus*

174. Scirpus atrocinctus Fernald, Proc. Amer. Acad. 34: 502. 1899.

GRAHAM ISLAND: near Juskatla, *S3547*.

Scirpus atrocinctus is a rare species on the Queen Charlotte Islands. It was not noted in the 1964 survey, but a few clumps were found in early August of 1957 in the bed of a small stream and along a roadside ditch a short distance south of Juskatla Logging Camp.

175. Scirpus cernuus Vahl, Enum. Pl. 2: 245. 1806.
S. riparius sensu Henry, Fl. South. B.C. 72. 1951.
S. cernuus var. *californicus* (Torr.) Beetle, Rhodora 46: 145. 1944.

GRAHAM ISLAND: Yakoun River Delta, *CST23498;* Kumdis Creek Delta, *CT23802, CT36118*.

Beetle (1946, p. 145) considers the North American population of *S. cernuus* that occurs along the Pacific coast from British Columbia to Mexico to be a distinct race, var. *californicus* (Torr.) Beetle. Although he found no differences between achenes of plants from the Old World and North America, he

believed that the Pacific coast population could be distinguished by shorter, stouter, more densely clumped, and often arcuate culms. All collections of *S. cernuus* we have seen from British Columbia are of the *californicus* type, but taller plants with flexuous and filiform culms are found in California and we have not been able to distinguish these plants from *S. cernuus* of Europe. It is quite possible that the degree of clumping, height, and attitude of the culms is only a reflection of the habitat and that the northern population of the British Columbia coast represents a somewhat depauperate phase. As the population along the Pacific coast is so variable and as we also find plants of the *californicus* type in the Old World, we do not recognize Beetle's variety. The conclusion we have reached is the same as that of Dr. T. Koyama (pers. comm.), who has studied the *S. cernuus* complex.

In the Queen Charlotte Islands *S. cernuus* was found only on tidal flats at the mouths of the Yakoun River and Kumdis Creek in Masset Inlet. It occurs along the margins of muddy runnels and in sparsely vegetated areas on alluvial flats. This species is at the northern limit of its range in North America on the Charlottes.

176. Scirpus cespitosus L., Sp. Pl. 1: 48. 1753.

GRAHAM ISLAND: Empire Anchorage, *CS21534;* about 8 mi SE of Port Clements, *CST22090;* Langara Island, *CST22586;* between Ells and Mercer pts., *CST22872;* 3½ mi NW of Tlell, *CTS34609;* Dawson Inlet, *CTS-35134;* N of Queen Charlotte City, July 5, 1952, *Schmidt;* Masset, Aug. 26, 1912, *Green* (UBC); Tlell, May 27, 1951, *Cowan* (UBC).

MORESBY ISLAND: White Swan Bog, *CST21039, CST21942;* Chaatl Narrows, *CST21792;* Bigsby Inlet, *CST22163;* Takakia Lake, *CST23077;* Upper Victoria Lake, *CT35750;* Sunday Inlet, *CT36620;* Canoe Pass, July 26, 1910, *Spreadborough* (CAN).

A number of authors consider the wide-ranging North American population of *S. cespitosus,* which extends from the Atlantic to the Pacific coast in Canada and southward in mountains of the eastern and western United States, to comprise two varieties: var. *callosus* Bigel. (=ssp. *austriacus* (Palla) Asch. & Graebn.) and var. *delicatulus* Fernald. The latter appears to be merely a less-robust plant and was not recognized by Beetle (1947, p. 494) in his treatment of *Scirpus* for *North American Flora.* This decision seems reasonable on the basis of the few collections of var. *delicatulus* that we have seen. The typical phase is a lowland plant that occurs in Europe along with ssp. *austriacus* and a further segregate, ssp. *germanicus* (Palla) Brodd. The diagnostic characters used for distinguishing these taxa and the North American var. *callosus* are essentially: plant size; the tightness, length of the notched opening, and width of the hyaline margins of the uppermost sheaths; the color, length, and shape of the glumes; and the number of flowers. Although there are slight differences between the lowland and northern-alpine population of *S. cespitosus* from Europe, we have not seen a large enough series from the Old

World to evaluate the taxonomic disposition of the various segregates that have been proposed. Dr. T. Koyama (pers. comm.), who is preparing a worldwide monograph of the genus *Scirpus,* does not think it is possible to subdivide this species into a number of formal taxonomic segregates.

Scirpus cespitosus occurs throughout the Queen Charlotte Islands. It is common in the lowland bogs of eastern Graham and northeastern Moresby islands, and on boggy slopes from sea level to tree line in the Queen Charlotte Ranges.

177. Scirpus lacustris L. ssp. **glaucus** (Smith) Hartm., Sv. Norsk Exc.-Fl. 10. 1846.

S. acutus Muhl. in Bigel., Fl. Bost. 15. 1814.
S. occidentalis (S. Wats.) Chase, Rhodora 6: 68. 1904.

GRAHAM ISLAND: between Tow Hill and Rose Spit, *CST21209;* Yakoun Lake, *CT36742;* MacIntosh Meadows, May 28, 1951, *Cowan* (UBC); Tlell, May 24, 1925, *W. A. Newcombe* (V).

In North America five species have been recognized in the *S. lacustris* complex. The identification of two of these, the widely distributed *S. acutus* Muhl. and *S. validus* Vahl, has been a continuing source of confusion to taxonomists. We have tried on a number of occasions to separate the two taxa on the basis of the diagnostic characters used in keys but have been completely frustrated. Koyama (1962, p. 922) in a recent paper considered that the two species should be treated as subspecific segregates of a single polymorphic species, *S. lacustris.* He has pointed out that *S. acutus* is identical to *S. tabernaemontani* C. C. Gmel. of Europe and that *S. validus* is comprised of two minor races, one confined to Asia, and the other occurring in North and South America. We are following Koyama's treatment, which is the first serious attempt to relate the Old and New World members. His recognition of *S. acutus* and *S. validus* as subspecific segregates of a single species more clearly indicates their close relationship and in our view appears to be fully justified on a morphological basis.

Scirpus lacustris ssp. *glaucus* is a rare species on the Queen Charlotte Islands. In 1957 a few plants were found in a meadow between old beach ridges near Rose Spit, and in 1964, we located a large colony in shallow water near the mouth of Baddeck Creek along the east shoreline of Yakoun Lake.

178. Scirpus sylvaticus L. ssp. **digynus** (Boeckl.) Koyama, Can. J. Bot. 43: 1392. 1965.

S. microcarpus Presl, Rel. Haenk. 1: 195. 1828.
S. sylvaticus var. *digynus* Boeckl., Linnaea 36: 727. 1870.

GRAHAM ISLAND: near Lawn Pt., *CST23269;* near Tlell, *CST23493;* near Juskatla, *S3501, CT35548;* Yakoun River about 4½ mi S of Port Clements, *CTS35032;* Naden Harbour, *CT36855.*

MORESBY ISLAND: White Swan Bog, *CT23668.*

Koyama (pers. comm.) has not yet completed his studies of *Scirpus* sect. *Scirpus* but he has come to a number of conclusions regarding the entities that should be recognized in this section. He considers that the closely related *S. microcarpus* and *S. rubrotinctus* Fernald, which occur in British Columbia, should be treated as subspecies of the European *S. sylvaticus* L. As he has pointed out to us, *S. rubrotinctus* is not very distinct from *S. microcarpus* except for its reddish sheaths and slightly smaller spikelets. The former species is common in eastern North America, but is of sporadic occurrence in British Columbia, where it is found only as far west as the east flank of the Coast Mountains. On the other hand, the strictly Cordilleran *S. microcarpus* is a coastal species in Alaska that extends inland in British Columbia and south to New Mexico and California. Although both these species have bifid styles and lenticular achenes, we are following Koyama in considering these entities as subspecies of the trifid-styled and trigonous-achened *S. sylvaticus*. The significance of the two- versus the three-styled condition in the evolutionary process is sometimes overemphasized in the Cyperaceae, for, in some species, such as *Carex pyrenaica* Wahlenb., both bifid- and trifid-styled plants may occur in the same plant.

On the Charlottes *S. sylvaticus* ssp. *digynus* is restricted to the lowlands of eastern Graham and northwestern Moresby islands. It is found on open river banks and flood plains, in marshes, and in cleared swamp habitats along roadsides.

Araceae

Lysichiton

179. Lysichiton americanum Hult. & St. John, Sv. Bot. Tidskr. 25: 455. 1931.
Lysichiton camtschatcense (L.) Schott, Oester. Bot. Wochenbl. 7: 62. 1857, Amer. auth. in part.

GRAHAM ISLAND: Masset, *CST20853;* Empire Anchorage, *CS21506;* near Skidegate, *CST21696;* Tlell, *CTS34648;* Yakoun River, June 11, 1952, *Schmidt;* Skidegate, May 1901, *Newcombe* (V).

MORESBY ISLAND: 1 mi E of Skidegate Lake, *CST20999;* Skidegate Lake, *CT35272;* Kootenay Inlet, *CT36228.*

Lysichiton americanum has a distribution pattern typical of a large group of species that occur in the Pacific Northwest. They have a strictly coastal distribution in the northern part of their range (Gulf of Alaska and Alaska panhandle) and a continental–coastal one south of about 55°N. The St. Elias and Coast Mountains north of the Skeena River trench have been an effective barrier to either eastward or westward migration. The distribution map of Hultén and St. John (1931, p. 461) for this species is inaccurate as far as British Columbia is concerned, for *L. americanum* extends north to at least 54°N in the eastern part of the province and we have found it far inland in the Coast Mountains east of Prince Rupert. Its northern limit in the interior is not known.

Lysichiton americanum, a common species on the Queen Charlotte Islands, was noted many times in low mucky areas and in wet mossy depressions in the lowland coniferous forests. It rarely flowers under densely shaded conditions and large colonies were entirely composed of sterile, depauperate plants. Young plants are often heavily browsed by deer. The skunklike odor of this western species is not as strong as that of the closely related *Symplocarpus foetidus* (L.) Nutt. of eastern North America.

Juncaceae

Capsules with many seeds; plants never hairy ..... *Juncus*
Capsules 3-seeded; plants with young stems and leaves frequently hairy ..... *Luzula*

Juncus

Inflorescence pseudolateral, subtended by a terete bract that looks like a continuation of the stem; culms leafless
  Tufted alpine plants; involucral bracts usually inconspicuous and rarely more than 2 cm long; flowers 1-4; seeds conspicuously tailed ..... *J. drummondii*
  Tufted (*effusus* only) or rhizomatous lowland plants; involucral bracts usually conspicuous and more than 5 cm long; flowers many; seeds not tailed
    Involucral bracts about as long as the culms below; stamens 6 ..... *J. filiformis*
    Involucral bracts never more than half as long as the culms below; stamens 3 or 6
      Plants tufted; stamens 3 ..... *J. effusus*
      Plants rhizomatous; stamens 6
        Inflorescence tightly congested; peduncles and pedicels short; sepals 5-6 mm long ..... *J. leseurii*
        Inflorescence more open; nearly always some flowers with long peduncles or pedicels; sepals 4-5 mm long ..... *J. arcticus*
Inflorescence appearing terminal, subtended by leafy or scalelike bracts; culms leafy
  Plants annual ..... *J. bufonius*
  Plants perennial
    Inflorescence simple or sparsely branched with 1-3 (-6) large densely flowered heads
      Plants caespitose; leaves filiform, 0.5 mm or less in width ..... *J. triglumis*
      Plants rhizomatous; largest leaves flat or terete, always more than 0.5 mm in width
        Leaves terete; bracts of the inflorescence conspicuous, light brown; stamens 6 ..... *J. mertensianus*

Leaves flat; bracts of the inflorescence inconspicuous or if evident greenish; stamens 3 or 6
Rhizomes scaly; leaves incompletely septate; stamens 6 ..... *J. falcatus*
Rhizomes not scaly; leaves not septate; stamens 3 ..... *J. ensifolius*
Inflorescence conspicuously branched, usually with more than 3 small loosely flowered heads
Leaves not septate ..... *J. tenuis*
Leaves septate
Plants tufted, often viviparous; perianth segments much shorter than the capsules .... *J. oreganus*
Plants rhizomatous, never viviparous; perianth segments the same length or slightly shorter than the capsules
Branches of inflorescence divaricate; capsules rather abruptly obtuse below the mucronate tip ..... *J. alpinus*
Branches of inflorescence erect or ascending; capsules acuminate below the mucronate tip ..... *J. articulatus*

180. Juncus alpinus Vill. ssp. **nodulosus** (Wahlenb.) Lindm., Sv. Fangerogamfl. 155. 1918.
J. richardsonianus Schultes in R. & S., Syst. Veg. 7: 201. 1829.
J. alpinus var. *insignis* E. Fries ex Engelm., Trans. Acad. St. Louis 2: 459. 1868.

MORESBY ISLAND: Mosquito Lake, *CT23656, CT35311;* Upper Victoria Lake, *CT35803.*

The only mature collection of *J. alpinus* from the Queen Charlotte Islands has few-flowered heads with a few of the flowers distinctly pediceled and elevated above the others. This is the entity treated by Lindquist (1932, p. 354) as var. *rariflorus* (E. Fries) Hartm. or as ssp. *nodulosus* (Wahlenb.) Lindm. by other authors. It is the common element of the *J. alpinus* complex of the Pacific Northwest and is recognized in many floras as *J. richardsonianus* Schultes. All the collections we have examined from the coast of British Columbia and southern Alaska are of the *nodulosus* type. Lindquist recognized a number of races in the *J. alpinus* complex, but as no one has critically examined the complex in North America we are unable to determine the number of segregates or their geographical limits.

The collections from the Queen Charlotte Islands are from a gravel beach at the east end of Mosquito Lake and from mucky and gravelly drainage flats in the bog near our campsite at the east end of Upper Victoria Lake. This species probably occurs sporadically throughout the lowlands, where there are many

suitable habitats. As *J. alpinus* matures late in the growing season, it was probably overlooked because we spent most of our time in the latter part of the 1957 and 1964 surveys in the alpine areas of the Queen Charlotte Ranges.

181. Juncus arcticus Willd., Sp. Pl. 2: 206. 1799.

Anthers as long as or slightly longer than the filaments . ssp. *sitchensis*
Anthers about twice as long as the filaments ..... ssp. *ater*

181a. Juncus arcticus Willd. ssp. **sitchensis** Engelm., Trans. Acad. St. Louis 2: 445. 1868.

GRAHAM ISLAND: Empire Anchorage, *CS21537;* Skidegate, *CST-22452;* Lepas Bay, *CST22619;* Juskatla, *S3522* (approaching ssp. *ater*); Dawson Inlet; *CTS35139.*

MORESBY ISLAND: about 3 mi S of mouth of Copper Creek, *CST-21929;* islet off Bolkus Islands, *CST22230;* Hotspring Island, *CST22283;* South Low Island, *CTS34855;* Gowdas Islands, *CT36578;* Sunday Inlet, *CT36641;* Yakulanas Bay, *CT36646;* Mike Inlet, *CT36659;* Rose Inlet, *CT36998;* Horn Rock, Aug. 8, 1957, *Mills;* Kaisun, July 1897, *Newcombe* (V); Tasu Sound, June 2, 1901, *Newcombe* (V).

181b. Juncus arcticus Willd. ssp. **ater** (Rydb.) Hult., Circump. Pl. 1: 24. 1962.
J. balticus var. *montanus* Engelm., Trans. Acad. St. Louis 2: 442. 1868.
J. ater Rydb., Fl. Rocky Mts. 1060. 1917.

GRAHAM ISLAND: Rose Spit, *CST21226;* Yakoun River Delta, *CT-23505, CT35470;* Kumdis Creek Delta, *CT36123;* about 3 mi E of Masset, *CT36829.*

Two taxa of the *J. arcticus – J. balticus* complex occur on the Queen Charlotte Islands and we believe they are best treated as races of the circumpolar *J. arcticus.* Subspecies *ater,* which is rare and of local occurrence, was found only on Graham Island, while ssp. *sitchensis* is widely distributed in coastal habitats throughout the Charlottes except in the northeast section of Graham Island, where it is apparently absent.

In 1868 in a treatment of the North American species of *Juncus,* Engelmann recognized that the Alaskan plant of the *arcticus–balticus* complex occurring on the Kodiak Islands and at Sitka was probably a distinct race of *J. arcticus.* He stated that he had not seen enough material to form a definite opinion, but he designated this plant ssp. *sitchensis* and pointed out that it could be distinguished from the typical phase by longer involucral bracts, larger flowers, and turbinate pyriform capsules with fewer and smaller seeds. This coastal subspecies is most distinct, but some of the diagnostic characters used by Engelmann to distinguish it from ssp. *arcticus* are of no significance. Subspecies *sitchensis* is a robust plant occasionally reaching a height of 90 cm. It has flowers with narrow, acute, spreading sepals and petals, and both these

floral parts may have recurved tips. The sepals and petals range from about 4 to 5 mm in length and the petals have narrow, relatively inconspicuous hyaline margins. The capsules, which more or less taper to a mucronate tip, are 4.5 to 5.5 mm long, and range from slightly shorter to slightly longer than the perianth. The arctic–montane ssp. *arcticus* is a smaller, less robust plant usually with shorter sepals and petals that are broader and more appressed to the capsules. The petals have conspicuous hyaline margins and are normally broader than the sepals, but are not as acute as the petals of ssp. *sitchensis*. Its capsules are usually abruptly apiculate and about 3 to 4 mm long. Subspecies *sitchensis,* the most common and widely distributed element of the *arcticus–balticus* complex along the Alaska – British Columbia coast, extends at least as far south as Hope Island, off the north end of Vancouver Island.

Hultén (1962, p. 24) has recently treated the more boreal *J. balticus* and its varieties, which include var. *littoralis* Buch., var. *stenocarpus* Buch. & Fern., and var. *montanus* Engelm. (=*J. ater* Rydb.), as races of *J. arcticus*. Porsild (1957, p. 60), on the other hand, recognizes two species in the *arcticus–balticus* complex. He referred the eastern subarctic plant, which extends from Greenland to the Hudson Bay region, to *J. arcticus* (in the restricted sense), and the Alaska – Yukon – Mackenzie District population to *J. balticus* var. *alaskanus* (Hult.) Porsild. Hultén (1943*a,* p. 418) in *Flora of Alaska and Yukon* first described the latter entity as a distinct race, *J. arcticus* ssp. *alaskanus,* but he now considers it as an intermediate population between *J. arcticus* ssp. *arcticus* and ssp. *littoralis*. We have carefully examined many collections from these regions and have found that the diagnostic characters used by Porsild for the recognition of two species are not reliable. The only entity in this complex that we recognize in the subarctic is *J. arcticus* ssp. *arcticus*. Intermediates occur where this subspecies meets the more open-panicled boreal ssp. *ater* or ssp. *littoralis*. The latter two subspecies extend farther north in the Mackenzie River basin than is indicated by most authors. Hultén's treatment of this complex is the more realistic, but the recognition of ssp. *ater* is questionable as it has never been critically compared with a group of closely related entities, which includes ssp. *littoralis* (Engelm.) Hult. and var. *stenocarpus* of eastern North America. This group has anthers two to four times as long as their filaments and is readily separated by this one character from *J. arcticus* sspp. *arcticus* and *sitchensis,* whose anthers and filaments are approximately equal in length. Five collections from the Queen Charlotte Islands that have anthers a little over twice as long as their filaments are tentatively referred to ssp. *ater*.

On the Queen Charlotte Islands, ssp. *sitchensis* is essentially a coastal element of beaches, rocky bluffs, and cliffs, but is found occasionally a short distance inland along rivers and streams. It is apparently absent from the extensive sand beaches and other seashore habitats of eastern and northeastern Graham Island, the only area where we find the closely related *J. leseurii*. Subspecies *ater* also has a distinct range on the Islands and occupies a different habitat. It was only found in brackish meadows of the Yakoun River and Kumdis Creek deltas at Masset Inlet, in a meadow back of the sand beach ridges near Masset, and in a gully between sand dunes at Rose Spit.

182. Juncus articulatus L., Sp. Pl. 1: 327. 1753.

GRAHAM ISLAND: Tlell, *CST23154;* about 2, 3 and 4 mi NW of Tlell, *CT35692, CST23470, CT35458;* 11½ mi S of Masset, *CT36910.*

Juncus articulatus is of sporadic occurrence in the southern interior of British Columbia from the Coast Mountains to the Rockies. It is common in marshes and in other moist habitats on Vancouver Island and the adjacent mainland, and its northern limit along the Northwest Pacific coast is on the Queen Charlotte Islands. We collected this species in saline meadows at Tlell and along roadside ditches between this settlement and Masset. Although we believe *J. articulatus* is native to the Charlottes it could have been introduced near the Richardson Ranch at Tlell, where a number of adventives have been found.

183. *Juncus bufonius L., Sp. Pl. 1: 328. 1753.

GRAHAM ISLAND: 4 mi S of Masset, *CST22810;* Queen Charlotte City, *CST23030;* Juskatla, *S3505;* Delkatla Inlet, *CT35584;* near mouth of Oeanda River, *CT35902;* Tlell, *CT35924.*

MORESBY ISLAND: Skidegate Lake Bridge, *CST21958, CT23631;* Hotspring Island, *CST22290;* Gray Bay, *CT35244.*

It is extremely unlikely that *J. bufonius* is native to the Queen Charlotte Islands for it was only noted in or near settlements and campsites along the east coasts of Moresby and Graham islands. This species was collected on roadside banks, in a meadow and on a gravel beach by one of the settlements, on a muddy river bank near one of the logging camps, at an old sawmill site, along the margins of a runnel from a hotspring at an old Haida campsite, and in other disturbed habitats.

184. Juncus drummondii E. Meyer in Ledeb., Fl. Ross. 4: 235. 1852.
J. subtriflorus (E. Meyer) Coville, Contr. U.S. Nat. Herb. 4: 208. 1893.

GRAHAM ISLAND: Shields Bay, *CT23349.*

MORESBY ISLAND: Mosquito Mtn., *CT23744.*

Juncus drummondii occurs throughout British Columbia and extends northward into the Cassiar, Pelly, and Selwyn mountains of Yukon and the Mackenzie Mountains of Mackenzie District. It is widely distributed along the coast to the Kenai Peninsula in Alaska and there are sporadic records to Attu Island in the Aleutian Chain. It is apparently absent from the central Alaska and adjacent Yukon regions that escaped glaciation during the Pleistocene.

The two collections of this species from the Islands are from steep rocky runnels near tree line in the Queen Charlotte Ranges. Although *J. drummondii*

was not found in 1964 and only noted twice during the 1957 survey, it probably occurs throughout the main mountain mass of Graham and Moresby islands.

185. Juncus effusus L., Sp. Pl. 1: 326. 1753.

Perianth and capsules pale brown	var. *pacificus*
Perianth and capsules dark brown	
Uppermost sheaths of culms coriaceous, lustrous, usually dark brown	var. *gracilis*
Uppermost sheaths of culms membranous, never lustrous, pale to light brown	var. *brunneus*

185a. Juncus effusus L. var. **brunneus** Engelm., Trans. Acad. St. Louis 2: 491. 1868.

MORESBY ISLAND: East Copper Island, *CST22262;* Upper Victoria Lake, *CT35801;* Kaisun, *CT36533;* Yakulanas Bay, *CT36649;* Rose Inlet, *CT36997;* Cape Fanny, Aug. 8, 1957, *Mills.*

185b. Juncus effusus L. var. **gracilis** Hook., Fl. Bor.-Amer. 2: 190. 1838.

MORESBY ISLAND: Alliford Bay, *CST23234;* between Cumshewa and Peel inlets, *CT35210;* about 3 mi E of Skidegate Lake, *CT36078.*

185c. Juncus effusus L. var. **pacificus** Fern. & Wieg., Rhodora 12: 89. 1910.

GRAHAM ISLAND: about 3 mi NW of Tlell, *CST23481;* Yakoun River about 4½ mi S of Port Clements, *CTS35036;* Mamin River Delta, *CT35545;* Juskatla, *T24A.*

MORESBY ISLAND: between Alliford Bay and Sandspit, *CST23241;* between Skidegate Lake and Copper Bay, *CT35260;* about 3 mi E of Skidegate Lake, *CT36079.*

Fernald and Wiegand (1910) in a study of the polymorphic *J. effusus* recognized nine varieties in North America, four of which were stated to be confined to the Pacific slope from southern British Columbia to California. This range should be extended north to include the Alaska panhandle. They cited collections of four races: var. *pacificus* Fern. & Wieg., var. *brunneus* Engelm., and var. *gracilis* Hook., from the extreme southwestern coastal region of British Columbia; and var. *exiguus* Fern. & Wieg., which is apparently confined to California. Henry (1915, p. 77) reported var. *brunneus* from Vancouver Island and var. *gracilis* from Sidney near Victoria. Presumably his *J. effusus* in the restricted sense is var. *pacificus.* Fernald and Wiegand in their key to the varieties distinguished the three races that occur in British Columbia as follows: (1) var. *gracilis* and var. *brunneus*—sepals rarely spreading, 2.5 to 2.9 mm long; perianth segments with two dark-brown lateral bands bordering a darker central portion, soft in texture, never rigid when dry; inflorescence

dense or somewhat loose, 1 to 4 cm in diameter; (1*a*) var. *gracilis*—"Uppermost sheath close, coriaceous, lustrous, usually castaneous throughout"; (1*b*) var. *brunneus* — "Uppermost sheath looser, membranous, dull, greenish-drab above"; (2) var. *pacificus*—sepals appressed or occasionally spreading, 2.5 to 4.2 mm long; perianth segments pale, the margins never dark brown, often firm in texture, rigid when dry; inflorescence open or occasionally dense, 1.5 to 14 cm in diameter. Mason (1957, p. 355) in his treatment of the marsh vegetation of California states that var. *brunneus* can be distinguished from var. *pacificus* by its more congested inflorescence, darker flowers, and paler, looser sheaths. He further states that var. *gracilis* and var. *exiguus* are essentially montane elements that may be merely "minor forms." We have not seen enough material of *J. effusus* from British Columbia and the Pacific states to arrive at any concrete conclusions as to the number of segregates that should be recognized in this region and consequently we are following the treatment of Fernald and Wiegand.

The collections of *J. effusus* from the Charlottes show considerable variation, yet they can be roughly segregated into the three native varieties that have been reported from British Columbia. All three varieties occur in open wet lowland habitats. The collections are from the upper margins of coastal beaches, creek and forest margins, meadows, logged-over areas, and disturbed sites along roadsides and in settlements. *Juncus effusus* var. *brunneus,* which was only collected in the southern part of Moresby Island and at Kaisun, can readily be distinguished from var. *pacificus* by conspicuously darker brown perianth segments, narrower culms, and sheaths that are pale to light brown above. Three collections from the northeastern lowlands of Moresby Island have been tentatively referred to var. *gracilis,* which is a weak entity that differs from var. *brunneus* in having the uppermost sheaths coriaceous, lustrous and darker colored. The more robust var. *pacificus* of the lowlands of eastern Graham and northeastern Moresby islands has pale flowers, broad culms, usually paler sheaths, and inflorescences open or congested.

186. Juncus ensifolius Wikstr., Vet.-akad. Stockholm Handl. 2: 274. 1823.

GRAHAM ISLAND: about 3 mi E of Tow Hill, *CST22747;* Tlell, *CST-23171;* 6 mi N of Skidegate Village, *CST23684;* 4 mi NW of Tlell, *CT35459;* near mouth of Oeanda River, *CT35895;* Yakoun Lake, *CT36764;* Skidegate, July 1897, *Newcombe* (V).

MORESBY ISLAND: between Sandspit and Copper Bay, *CST23195;* Skidegate Lake Bridge, *CT23642; CT35154;* Upper Victoria Lake, *CT35765;* Sandspit, *CT36023.*

Juncus ensifolius is common throughout southern British Columbia and is widely distributed along the Alaska coast to the Aleutian Islands. It is rare in the central part of the province, but we have seen a few collections as far north as the latitude of Prince George and Burns Lake.

This species of meadows, marshes, and bogs is common in the lowlands of eastern Graham and northeastern Moresby islands. There are disjunct low-

land records from Upper Victoria Lake near the south end of Moresby Island and from the abandoned Haida village of Dadens on Langara Island.

187. Juncus falcatus E. Meyer, Syn. Luzularum 34. 1823.

J. falcatus var. *sitchensis* Buch., Bot. Jahrb. 12: 428. 1890; *J. falcatus* ssp. *sitchensis* (Buch.) Hult., Fl. Alaska & Yukon 3: 427. 1943.
J. falcatus var. *alaskensis* Coville, Contr. U.S. Nat. Herb. 3: 347. 1895.
J. falcatus var. *prominens* Buch., Pflanzenreich IV. 36: 247. 1906.
J. covillei sensu Henry, Fl. South. B.C. 79. 1915.
J. orthophyllus sensu Henry, *l.c.*

GRAHAM ISLAND: about 2 and 4 mi NW of Tlell, *CT35691, CST-20948;* near Tow Hill, *CST22660, CST22731;* mouth of Sangan River, *CST-22770;* Tlell, *CST23165;* about 2½ mi E of Masset, *CT35604;* near mouth of Oeanda River, *CT35897;* Yakoun Lake, *CT36767.*

MORESBY ISLAND: Upper Victoria Lake, *CT35812;* Mosquito Lake, *CT36706.*

Juncus covillei Piper, *J. orthophyllus* Coville and *J. falcatus,* a complex of three closely related species of the subgenus *Graminifolii* Buch., were recorded by Henry (1915, p. 79) in his *Flora of Southern British Columbia* from the coastal region between the Washington border and the Queen Charlotte Islands. All collections of this complex examined from British Columbia are *J. falcatus* and it is doubtful if either of the other two species occur in the province. *Juncus covillei* differs from the other species in its fewer-flowered heads, paler and more obtuse perianth segments and narrow, more oblong capsules which at maturity project well beyond the perianth segments. Mason (1957, p. 375) has recently pointed out that whereas *J. falcatus* and *J. covillei* may intergrade, the latter, at least in California, is essentially an inland species that usually occurs at higher altitudes. *Juncus orthophyllus* is an alpine or subalpine meadow species that extends from the Cascades of Washington south to the Coast Ranges and Sierra Nevada of California.

Juncus falcatus, which was based on a Haenke collection from Monterey, California, was described by Meyer in 1823. Buchenau in his 1890 *Monographia Juncacearum* recognized a variety *sitchensis,* presumably from Sitka in Alaska, which he distinguished from the typical phase by its obcordate, retuse, and completely triseptate capsules. Later in his 1906 treatment of *Juncus* in *Das Pflanzenreich* he described a second variety, *prominens,* based on collections from Washington and Japan. Although the Japanese plant may be distinct, the varieties recognized by Buchenau in North America do not appear to merit recognition, even though *J. falcatus* is an extremely variable species. Buchenau was aware of this variation, for in a footnote he commented that it is sometimes difficult to distinguish between *J. falcatus* and its related species. Hultén (1943*a,* p. 427) recognized ssp. *sitchensis* by its short styles and filaments, but these characters were found to be of no significance in the series of specimens we examined.

In British Columbia, plants of *J. falcatus* may be short or tall with 1 to 3(-6) heads per culm and with 2 to 20 flowers per head. The central portion of the perianth segments are conspicuously green just before anthesis but become brownish as the capsules mature; the inner perianth segments are scarious-margined but never as conspicuously so as in *J. covillei;* and the capsules, which range from slightly shorter to slightly longer than the perianth, vary from obtusely to retusely apiculate.

Juncus falcatus is found throughout the lowland sections of eastern Graham and northeastern Moresby islands and there is a disjunct record from Upper Victoria Lake. It is a species of sphagnum bogs and marshy meadows but often occurs in sandy soils along river banks and lake margins.

188. Juncus filiformis L., Sp. Pl. 1: 326. 1753.

GRAHAM ISLAND: about 3 mi E of Tow Hill, *CST22730;* Yakoun Lake, *CT36765.*

MORESBY ISLAND: E end of Skidegate Lake, *CST23434, CT35264;* Mosquito Lake, *CT23661;* bridge at Skidegate Lake, *CT36052.*

Juncus filiformis is widely distributed throughout British Columbia, but is of sporadic occurrence in Alaska and Yukon. It is rare on the Charlottes, where it is apparently restricted to the lowlands of eastern Graham and Moresby islands. In 1957 it was found in a flooded marsh near Tow Hill and on gravel flats along the shorelines of Mosquito and Skidegate lakes. An additional station was located in 1964 along the east shore of Yakoun Lake near the mouth of Baddeck Creek.

189. Juncus leseurii Boland., Proc. Calif. Acad. 2: 179. 1862.

GRAHAM ISLAND: Tlell, *CST23162, CST23247, CT35931;* Delkatla Inlet, *CT35592;* about 2½ and 6½ mi E of Masset, *CT35607, CT35606;* about 4 mi N of mouth of Oeanda River, *CT35863.*

The strictly coastal *J. leseurii* is closely related to *J. arcticus* ssp. *sitchensis* Engelm., but can be readily distinguished from this species by its longer perianth segments, which have conspicuous green centers, submarginal brown stripes and white opaque margins. *Juncus leseurii,* which is at the northern limit of its range in the Queen Charlotte Islands, extends south to California and also occurs along the west coast of South America.

On the Charlottes *J. leseurii* is only known from the northeast section of Graham Island, where it is restricted to brackish or saline meadows and sandy habitats in the immediate vicinity of the coast. In Delkatla Inlet at Masset it occurs with *Calamagrostis crassiglumis* Thurb. in saline meadows in a narrow zone along the forest margin and it was found in a similar habitat near the Richardson Ranch at Tlell. It also occurs on sand flats and dunes and in depressions at the upper limits of the extensive sand beaches along the east and

north coasts of Graham Island from Tlell to Masset. This species with its long-creeping, stout rhizomes is an effective sand binder. Other beach species that serve as sand binders are *Carex macrocephala* Willd., *Elymus mollis* Trin., and *Poa douglasii* ssp. *macrantha* (Vasey) Keck.

190. Juncus mertensianus Bong., Mém. Acad. St. Pétersb. VI. 2: 167. 1832.

GRAHAM ISLAND: Shields Bay, *CT23367.*

MORESBY ISLAND: Takakia Lake, *CST23140, CT36322;* Mt. de la Touche, *CT23585;* Mosquito Mtn., *CT23712;* between Cumshewa and Peel inlets, *CT35169*; Mt. Moresby, *CT36407.*

In a recent treatment of the *J. mertensianus* complex, Hermann (1964, p. 81-87) recognized a single species, *J. mertensianus,* with six segregates at subspecific rank. Only ssp. *mertensianus* occurs in Canada, the other infraspecific taxa being confined to the western United States. This species is one of the most common alpine members of the genus in the Pacific Northwest. Its distribution in the northern part of its range is essentially the same as that of *J. drummondii* E. Meyer, that is, along the Alaska coast to the Aleutian Islands and in Yukon to the Selwyn Mountains at about 63°N.

On the Queen Charlotte Islands *J. mertensianus* was found only in the main mountain mass of the Queen Charlotte Ranges between the head of Shields Bay and Tasu Sound. It is a subalpine or alpine species of rocky slopes and flats and occasionally occurs in closed communities on heathy slopes. The collection cited from Mount Moresby is from the margin of a steep, north-facing rocky runnel about 1,000 ft below tree line.

191. Juncus oreganus S. Wats., Proc. Amer. Acad. 23: 267. 1888.
J. paucicapitatus Buch., Bot. Jahrb. 12: 367. 1890.

GRAHAM ISLAND: Langara Island, *CST22512;* about 2 mi E of Tow Hill, *CST22745;* 6 mi S of Juskatla, *CT35487;* about 15 mi S of Masset, *CT35566;* about 4 mi N of mouth of Oeanda River, *CT35854;* Pure Lake, *CT36100;* Yakoun Lake, *CT36749.*

MORESBY ISLAND: Chaatl Narrows, *CST21768;* 4 mi S of Sandspit, *CST22064;* Bigsby Inlet, *CST22142;* Echo Harbour, *CST22367;* Mt. de la Touche, *CT23579;* Skidegate Lake Bridge, *CT23641, CT36060, CT36066, CT36730;* between Aero and Moresby Logging Camps, *CT35285;* Upper Victoria Lake, *CT35762;* Sunday Inlet, *CT36588.*

Juncus oreganus is distributed along the Pacific coast from Washington to Kodiak Island in the Gulf of Alaska. It is common in marshes and bogs throughout the Queen Charlotte Islands in or along the margins of shallow, mucky-bottomed pools and ponds. In the Queen Charlotte ranges it is found in similar habitats to at least 1,000 ft. This species will not withstand severe competition from other marsh and bog plants. Almost all colonies that we

examined on the Charlottes and Vancouver Island contained a high percentage of viviparous plants.

192. *Juncus tenuis Willd., Sp. Pl. 2: 214. 1799.

GRAHAM ISLAND: Juskatla, *T23A;* Mamin River Delta, *CT35544;* Skidegate Village, *CT36957.*

MORESBY ISLAND: Skidegate Lake, *CT23632.*

The four collections of *J. tenuis* from the Queen Charlotte Islands belong to ssp. *tenuis,* which has leaf sheaths with white, scarious, friable auricles. The other widely distributed segregate, var. *dudleyi* (Wieg.) Hermann, of southern British Columbia has auricles that are yellowish, stiff, cartilaginous, and shorter than in the typical phase. *Juncus tenuis* ssp. *tenuis* becomes progressively rarer towards northern British Columbia and is not known from the northern part of the province or Yukon. Its northern limit along the coast is in the southern part of the Alaska panhandle, where it was reported by Hultén (1943*a*, p. 428) under *J. macer* S. F. Gray from a few localities.

On the Queen Charlotte Islands, *J. tenuis,* a weedy species, was found in clearings and on a sandy river bench near Juskatla Logging Camp in Masset Inlet, in a sandy seepage area near the bridge that spans Skidegate Lake, and along a forest trail near Skidegate Village. As other adventives were found in the three areas it is probably not native to the Charlottes.

193. Juncus triglumis L., Sp. Pl. 1: 328. 1753.

J. triglumis var. *albescens* Lange, Consp. Fl. Groenl. 123. 1880; *J. albescens* (Lange) Fernald, Rhodora 26: 202. 1924; *J. triglumis* ssp. *albescens* (Lange) Hult., Circump. Pl. 241. 1962.

MORESBY ISLAND: Upper Victoria Lake, *CT35802;* Wells Cove, July 14, 1966, *Schofield* (UBC).

The arctic–alpine *Juncus* of North America, which for many years had been referred to *J. triglumis,* was recognized in 1924 by Fernald (1924*b,* p. 201-203) as a distinct species, *J. albescens,* on the basis of Lange's var. *albescens,* which was described from Greenland material. In recent years most North American authors have followed Fernald's treatment. Hultén (1962, p. 48, 241, 242), however, has recently pointed out that the North American population as a whole is not distinct from the plant of Eurasia and that almost all the morphological characters used by Fernald to distinguish two species are not reliable when a large series of specimens from the Old and New World are compared. Fernald apparently described *J. albescens* entirely on the basis of material in the Gray Herbarium, which unfortunately in 1924 was strongly weighted in collections from eastern North America. In recent years much western and arctic North American material has accumulated in Canadian herbaria and, although we are now in a better position to assess the variation in

this complex, we have not found it feasible to carry out a definitive study in this flora. Fernald enumerated what he thought were the major differences between the Old and New World populations as follows:

	triglumis	**albescens**
bracts of inflorescence	usually obtuse or the lower mucronate, normally shorter than the flowers	lower long-acuminate or long awned, the same length or longer than the lowest flower
capsules	6 - 7 mm long, conspicuously exserted, firm, castaneous, conic to rounded at apex	3 - 4 mm long, included or barely exserted, thinner, paler, rounded to subtruncate at apex
seeds (including tails)	2.3 - 3 mm long	1.3 - 2 mm long

Fernald also stated that there is a marked tendency for North American plants to have paler, more delicate bracts and perianth segments and weaker filaments that become bent and shriveled after anthesis. We agree that there is a tendency for the North American population to have paler perianth segments and bracts, and included or barely exserted capsules, but other characters such as bract shape and length, capsule texture, color, shape and length, and seed length are entirely unreliable for separating the two species. We have examined a large series of specimens and find, for example, that Fernald's capsule and seed measurements are incorrect in part: (1) North American material, capsules 3 to 4.5 mm long, seeds 1 to 1.8 mm long; (2) European material, capsules 3.4 to 5.5 mm long, seeds 1.3 to 2.2 mm long.

Hultén (*op. cit.*) considers that *J. triglumis* is a circumpolar species comprised of two races, ssp. *triglumis* and ssp. *albescens* (Lange) Hult. He interprets ssp. *triglumis* as a circumpolar arctic–alpine race and ssp. *albescens* as a more southern element, which occupies much of the same area but is restricted to Greenland, North America and eastern Asia. We agree with Hultén that some collections from North America can readily be separated from the European plant on perianth characters. However, we have found no reliable morphological character or combination of characters that will consistently separate the two taxa; and, until it can be clearly demonstrated that there are two races which can be distinguished on a morphological–geographical basis we will recognize but a single taxon, *J. triglumis*.

Juncus triglumis is a rare species on the Queen Charlotte Islands. A single small colony was found on open mucky and gravelly flats of a drainage course in the boggy region near our camp site at the east end of Upper Victoria Lake and at nearby Wells Cove. These are the southernmost records of this species along the North American Pacific coast.

Luzula

Flowers crowded in spikes or glomerules ..... L. *multiflora*
Flowers solitary or in clusters of 2 or 3 in an open panicle L. *parviflora*

194a. Luzula multiflora (Retz.) Lejeune, Rev. Fl. Spa 1: 169. 1811.

GRAHAM ISLAND: near mouth of Sangan River, *CST21152;* between Tow Hill and Rose Spit, *CST21216A & B;* about 2½ mi S of Tlell, *CST21341;* Mercer Lake, *CS21502;* 3 mi N of Lawnhill, *CST21728;* Langara Island, *CST22527, CST22570;* Lepas Bay, *CST22601;* near Tow Hill, *CST22704;* Dawson Inlet, *CST22859, CTS35090;* between Ells and Mercer pts., *CST-22909;* Tlell, *CST23164;* Shields Bay, *CT23291, CT23362;* 6, 9 and 10 mi south of Juskatla, *CT35512, T82, T7;* Jalun Lake, *CT35684;* about 4 mi N of Oeanda River, *CT35861;* Yakoun Lake, *CT36757;* Yakan Pt., *CT36813;* Naden Harbour, *CT36858;* MacIntosh Meadows, July 23, 1961, *Foster & Bigg* (UBC).

MORESBY ISLAND: Chaatl Narrows, *CST21777;* Newcombe Peak, *CST22033;* Echo Harbour, *CST22343;* Takakia Lake, *CST23125, CT36305;* Mt. de la Touche, *CT23602;* Mosquito Mtn., *CT23724;* between Cumshewa and Peel inlets, *CT35209;* Red Mud Marsh, *CT35362;* Upper Victoria Lake, *CT35818;* Kootenay Inlet, *CT36190;* Sunday Inlet, *CT36614.*

194b. Luzula multiflora (Retz.) Lejeune ssp. **comosa** (E. Meyer) Hult., Fl. Alaska & Yukon 3: 437. 1943.
L. comosa E. Meyer, Syn. Luzul. 21. 1823.

GRAHAM ISLAND: Haida Pt., *CST20881;* between Skidegate and Skidegate Village, *CST21398;* Queen Charlotte City, *CST22480;* 2½ mi SE of Port Clements, *CTS34593;* Yakoun River about 4½ mi S of Port Clements, *CTS35041;* Towustasin Hill, *CT35522;* Mamin River Delta, *CT35541;* Skidegate, May 31, 1923, *Newcombe* (V).

MORESBY ISLAND: near Alliford Bay, *CST21060, CST21850;* East Copper Island, *CST22257;* Hotspring Island, *CST22285;* Limestone Island, *CST22415;* Dass Pt., *CTS35019;* between Cumshewa and Peel inlets, *CT-35207.*

This highly variable species is widely distributed throughout the temperate regions of both the Northern and Southern hemispheres. Many entities have been recognized at subspecific rank. Buchenau (1906) in a monograph of the Juncaceae recognized 20 varieties whereas Hultén (1962, p. 72, map 64) in a recent phytogeographic treatment of some circumpolar species reported seven taxa. Six taxa are recorded for the Pacific Northwest and although we are unable to solve any of the taxonomic problems in this complex we believe that Hultén's treatment is neither taxonomically nor phytogeographically realistic. In his distribution map of the *L. multiflora* complex he gives the ranges of the six entities that occur in British Columbia as follows: (1) ssp. *multiflora,* southern part of the province from the Rocky Mountains to Vancouver Island, (2) ssp. *comosa,* north along the coast to the southern part of the Alaska panhandle, but also inland in the extreme southern part of the province to the Rocky Mountains, (3) ssp. *frigida* (Buch.) Sam., central Alaska, Yukon and

British Columbia east of the Coast Mountains and south to about 57°N, (4) ssp. *frigida* var. *intermedia* Rydb., an extension of the range of typical ssp. *frigida* south to New Mexico, Arizona and California, and (5 and 6) ssp. *multiflora* vars. *kobayasii* (Satake) Sam. and *kjellmanniana* (Kudo) Sam., which are essentially coastal elements that reach the southern limit of their North American ranges in the southern part of the Alaska panhandle. Anyone who has studied the *L. multiflora* complex in the Pacific Northwest would not dispute the existence of races in this region. However, the number of taxa recognized by Hultén and their distributions as he has interpreted them are not in accord with our knowledge of plant distribution patterns and race formation in British Columbia.

On the Queen Charlotte Islands there are two distinct populations. One of these, ssp. *comosa,* occurs in the vicinity of Skidegate and Queen Charlotte City, south of Masset Inlet between Juskatla and Port Clements, and along the east coast of Moresby Island. It is usually a coastal element of rocky bluffs, cliffs, beaches and exposed shorelines, but it also occurs inland in disturbed forest habitats and along river banks. Subspecies *comosa* is usually high-grown with broad leaves, leaflike bracts, a somewhat loosely flowered spike, and light-brownish to yellowish-green capsules that are often reddish-tinged at the apex and which occasionally turn dark-brown at maturity. This race is quite distinct in the Queen Charlotte Islands, but in southern British Columbia it intergrades with what we consider to be typical *L. multiflora.* A second type with dark-brown to blackish perianths and capsules occupies the remaining part of the Islands. It occurs in a wide range of habitats such as meadows, bogs, open coniferous forests, lakeshores, coastal bluffs, sea beaches, and grassy and heathy alpine slopes. Included in this material are plants that are high grown, relatively broad-leaved and with the perianth parts conspicuously hyaline-margined and exceeding the mature capsules. Such plants, especially common at the coast, were collected at Lepas Bay, Langara Island, and along the coast of Graham Island between Tlell and Port Clements. We presume that these plants with conspicuously hyaline-margined capsules would be referred to var. *kobayasii,* but they appear to fully intergrade with often less robust plants having narrower leaves and almost entirely brown perianths that may be longer or shorter than the capsules. The latter population, the only phase that is found in the Queen Charlotte Ranges, would probably be identified by most botanists as var. *kjellmanniana.* With the exception of the distinct ssp. *comosa,* no useful purpose would be achieved in trying to pigeonhole the remaining collections from the Queen Charlotte Islands under the many names available, and we treat them as belonging to *L. multiflora* in the broad sense. Plants referred to *L. campestris* (L.) DC. by western authors belong to the *L. multiflora* complex.

195. Luzula parviflora (Ehrh.) Desv., J. Bot. Rédigé 1: 144. 1808.

195a. Lowland Phase

GRAHAM ISLAND: McClinton Bay, *CST21674;* Langara Island, *CST-22579,* June 1, 1952, *Guiget* (V); Dawson Inlet, *CST22860, CTS35091;* about

6 mi N of Skidegate Village, *CT23685;* Juskatla, *T24;* 2½ mi SE of Port Clements, *CTS34596;* Blackwater Creek, *CTS35065;* Tlell, June 2, 1951, *Cowan* (UBC); Masset, July 1914, *Green* (UBC); Skidegate, July 1897 and May 28, 1923, *Newcombe* (V); Sisk, June 4, 1913, *Newcombe* (V).

MORESBY ISLAND: head of Cumshewa Inlet, *CST20964;* near Alliford Bay, *CST21061;* Sandspit, *CST21836;* East Copper Island, *CST22252;* Deena River, *CT23769;* Limestone Island, *CTS34828;* Crescent Inlet, *CTS-34982;* 1 mi S of Sandspit, *CT35337;* Kaisun, *CT36558;* Church Creek, *Pillsbury 338* (DAO, UBC); Skincuttle, June 1901, *Newcombe* (V).

195b. Alpine Phase

GRAHAM ISLAND: Shields Bay, *CT23341.*

MORESBY ISLAND: Takakia Lake, *CST23124, CT36314;* Mt. de la Touche, *CT23580, CT23603;* Mosquito Mtn., *CT23758, CT36476.*

Over the past 15 years there have accumulated in the Plant Research Institute approximately 200 collections from Alaska, Yukon, British Columbia and western Alberta of the *L. parviflora* complex, in which we include *L. wahlenbergii* Rupr., *L. divaricata* S. Wats. and *L. piperi* (Coville) M. E. Jones. We had hoped that an examination of our specimens from this region would help clarify some of the taxonomic problems, but unfortunately it has only compounded the difficulties. For comparative purposes we have made a survey of most of the important North American floras and in the accompanying Table 21 have incorporated the key characters used in distinguishing the various taxa that occur in this complex in the Pacific Northwest.

Scandinavian collections of *L. wahlenbergii* and *L. parviflora* can usually be readily separated on bract characters. In *L. wahlenbergii* they are lacerate and conspicuously ciliate, whereas in *L. parviflora* they are almost entire or weakly lacerate with few cilia. There is also a strong tendency for the latter species to have more and broader stem leaves. In western North America there is no such clear-cut distinction between these two species and this may have led Coville to describe *L. piperi,* which is a southern robust phase of *L. wahlenbergii.* In discussing *L. wahlenbergii* in Alaska, Hultén (1943, p. 443) points out that plants from the south coast are often high-grown with broad leaves and thus resemble *L. parviflora,* but, he adds that these collections have the pilose and lacerate bracts of *L. wahlenbergii.* We have examined many collections from coastal Alaska and British Columbia and the bract characters are so variable that we have not been able to distinguish the two species in this entire region.

A third species in this complex, *L. divaricata,* which has been reported from British Columbia and Alaska, is treated by Hultén (1943, p. 441) as a subspecies of *L. parviflora.* According to Hultén (1962, p. 56, 57; *pl.* 50) it is restricted in the northern part of its range to coastal Alaska and British Columbia but extends inland at about the 49th parallel to the Rocky Mountains, and ranges southward in the coastal mountains to the Sierra Nevada of California.

Table 21. A comparison of some taxa in the *Luzula parviflora* complex

	parviflora	*wahlenbergii*	*piperi*	*divaricata*
height	up to 6 dm	1-2.5 dm	2-4 dm	2-5 dm
basal leaves	thin, shiny, hairy at base	thick, dull, green	thick, dull	shiny, not hairy at base
stem leaves	usually more than 2, up to 10 mm wide	1-2, short, 2-5 mm wide	1-3	usually more than 2
panicle branches	slender, lax, drooping	slender, lax, drooping	slender, lax, drooping	strongly divaricate
bracts	essentially entire to weakly lacerate and ciliate	lacerate and abundantly ciliate	lacerate and ciliate	entire to somewhat lacerate
perianth	pale green	dark brown	dark brown	light brown
anthers	longer than filaments	shorter than filaments	(not known)	about as long as filaments
capsules	pale green	dark brown	dark brown	greenish
seeds	brown, ellipsoid, smooth	yellowish to grayish-brown, rough	yellow, constricted at each end	light brown

Coville (1893, p. 209), who had a wide knowledge of the Juncaceae, stated in *Botany of the Death Valley Expedition* that "the species, in its typical form at least, has been collected only in the Sierra Nevada." We have seen five collections from this region and agree with Coville that the California population is distinct from what has been called *L. divaricata* along the British Columbia – Alaska coast. However, on southeastern Vancouver Island and the adjacent mainland there is a plant closely related to *L. divaricata,* but with leaves slightly hairy at the base and with panicle branches that are never as conspicuously divaricate as in the California plant.

One other taxon in this complex, *L. parviflora* var. *melanocarpa* (Michx.) Buch., has been reported from British Columbia. This is the plant that was described by Michaux as "capsulis nigricantibus," and recognized by Buchenau as being a taller plant with more diffuse horizontal branches, a pale or stramineous perianth, and usually brown to blackish capsules.

In British Columbia there are essentially two populations in the *L. parviflora* complex. The first is a plant about 10 to 60 cm high having lax, drooping panicles with arcuate capillary peduncles and pedicels. It has light- to dark-brown or occasionally blackish capsules, a light- to dark-brown perianth, and bracts that vary from weakly to strongly lacerate and ciliate. The seeds in mature capsules usually range from blackish brown to light brown but occasionally are yellowish or even green. Such a description includes *L. parviflora* and its var. *melanocarpa,* and *L. wahlenbergii.* There is, however, so much variation in this complex that we are unwilling to recognize the two species in British Columbia and for the time being are referring all collections to *L. parviflora.* At the coast such plants are restricted to mountain slopes and the subalpine zone, whereas in the interior they occur in both lowland and subalpine habitats. In the lowlands from Vancouver Island to the Alaska panhandle there is a second plant that strongly suggests introgression of *L. parviflora* with *L. divaricata.* It has more divaricate and less flexuous panicle branches, weakly

to strongly lacerate and ciliate bracts, a yellowish or light brownish-green perianth, green capsules and brownish seeds. Intermediates between the two types occur sporadically throughout the southern part of the province.

Both types occur in the Queen Charlotte Islands. The pale-flowered "lowland phase" is widely distributed in forest openings, on coastal bluffs and in other open shoreline habitats. The dark-flowered "alpine phase" that would be treated by some authors as *L. wahlenbergii* is rare and is restricted to open grassy or heathy slopes of the Queen Charlotte Ranges.

Liliaceae

Leaves linear, never in whorls
- Inflorescence single-flowered or a 2- to 3-flowered raceme ..... *Lloydia*
- Inflorescence always many-flowered
  - Inflorescence umbellate, perianth purple; stems glabrous ..... *Allium*
  - Inflorescence racemose, perianth white; stems glandular ..... *Tofieldia*

Leaves never linear except occasionally in *Fritillaria,* which has whorled leaves
- Leaves in whorls; perianth chocolate brown ..... *Fritillaria*
- Leaves never in whorls; perianth never chocolate brown
  - Leaves cordate, petiolate ..... *Maianthemum*
  - Leaves never cordate or petiolate
    - Inflorescence terminal, paniculate; leaves clasping, extending down and sheathing the stems ..... *Veratrum*
    - Inflorescence axillary, 1- to 2-flowered; leaves often clasping but never extending down and sheathing the stems ..... *Streptopus*

Allium

196. *Allium schoenoprasum L., Sp. Pl. 1: 301. 1753.
A. schoenoprasum var. *sibiricum* Hartm., Handb. Skand. Fl. ed. 4. 102. 1843.

MORESBY ISLAND: Alliford Bay, *CST21126.*

The disposition of the varieties recognized for this species in North America has been carefully appraised by Ownbey (1950). We fully concur with his conclusion that var. *sibiricum* Hartm., a name frequently applied to western North American plants, does not warrant taxonomic recognition.

This species is not native along the coast of British Columbia, although it is widely and sporadically distributed east of the Coast Mountains. The single record from the Queen Charlotte Islands represents an escaped introduction.

In 1957 it was observed growing in a rock garden near the abandoned cannery and aircraft hanger at Alliford Bay and a few plants were found growing along the upper part of the beach a short distance away.

Fritillaria

197. Fritillaria camschatcensis (L.) Ker-Gawl., Bot. Mag. 30. *pl.* 1216. 1809.
F. kamtschatcensis var. *angustifolia* Henry, Fl. South. B.C. 88. 1915.

GRAHAM ISLAND: Haida Pt., *CST20862;* Tlell, *CST21362, CTS-35082;* Yakoun River Delta, *CST21549;* McClinton Bay, *CST21570;* Torrens Island, *CST22440;* Lina Island, *CST22913;* Long Inlet, *CTS36003;* Juskatla, June 7, 1952, *Schmidt;* Masset, 1929, *Young* (V); Langara Island, June 13, 1956, *Widdowson* (UBC); Skidegate Channel, June 9, 1959, *Brown* (V); Hippa Island, June 6, 1913, *Newcombe* (V).

MORESBY ISLAND: Mosquito Lake, *CST21026;* White Swan Bog, *CST21033;* Chaatl Narrows, *CST21781;* head of Cumshewa Inlet, *CST21977;* islet off Bolkus Islands, *CST22238;* Skedans Islands, *CST22392;* South Low Island, *CTS34836;* Tuft Islets, *CTS34862;* Low Island, *CTS35013;* Upper Victoria Lake, *CT35787;* Takakia Lake, *CT36313, Foster & Joslin 59* (UBC); Lockeport, June 1, 1923, *Newcombe* (V); Canoe Channel, June 23, 1897, *Newcombe* (V); near Skedans, May 1901, *Newcombe* (V).

Fritillaria camschatcensis is an extremely variable species as to stature, leaf shape and size, and number of flowers. Henry (1915, p. 88) described plants with leaves 1 cm or less in width as var. *angustifolia,* but such plants should not be accorded formal taxonomic recognition as there is no clear-cut line of distinction between narrow- and broad-leaved types throughout the range of the species. Along the southeast coast of Vancouver Island, where *F. camschatcensis* and *F. lanceolata* Pursh occur in nearby habitats, there has been extensive introgression.

On the Charlottes *F. camschatcensis* is usually found in the immediate vicinity of the coast. It occurs on rocky bluffs, in moist pockets on sea cliffs, in tidal sedge meadows and commonly in the grassy swards along the upper margins of beaches. It is not strictly a coastal species or an obligate halophyte because it is occasionally found inland in bogs, on lake shores and in meadows on mountain slopes well above tree line.

Lloydia

198. Lloydia serotina (L.) Reichenb. ssp. **flava** Calder & Taylor, Can. J. Bot. 43: 1392. 1965.

GRAHAM ISLAND: Empire Anchorage, *CS21483;* Tan Mtn., *CST-21583;* Dawson Inlet, *CST22863;* between Ells and Mercer pts., *CST22888;* Shields Bay, *CT23292;* Jalun Lake, *CT35646;* Long Inlet, *CT35990;* Mt. Needham, June 18, 1961, *Foster & Bigg* (UBC).

MORESBY ISLAND: Chaatl Narrows, *CST21769;* Newcombe Peak, *CST22003;* Bigsby Inlet, *CST22169, CTS34884;* Echo Harbour, *CST22375;* Takakia Lake, *CST23107, CT36266,* June 18, 1960, *Foster & Joslin* (UBC); Mt. de la Touche, *CT23564;* Mosquito Mtn., *CT23755;* Anna Inlet, *CTS-34920;* Yatza Mtn., *CT35715;* Mt. Russ, *CT36163;* Sunday Inlet, *CT36615;* Tasu Sound, July 1961, *Foster & Bigg* (UBC).

Lloydia serotina, a widely distributed circumboreal species, is remarkably uniform throughout most of its range. An exception to this uniformity is found in the Queen Charlotte Islands population. The yellow- or green-veined tepals of plants from this region contrast with the purplish-veined tepals of the typical phase of Eurasia and North America. In addition, plants from the Islands are somewhat more robust and grow to 40 cm high; they have larger flowers and well-developed leaves that nearly always conspicuously exceed the flowering or capsule-bearing stalks. On the basis of these differences we recognize the Queen Charlotte Islands population as a distinct race, ssp. *flava.*

Lloydia serotina ssp. *flava* is widely distributed throughout the Queen Charlotte Ranges, extending from near sea level in open exposed rocky habitats to similar exposures above tree line. It is an early-flowering snow-flush species that is best developed in niches along cliff faces or along the rocky walls of runnels where competition is not too severe. *Lloydia serotina* is frequently associated with *Saxifraga taylori* Calder & Savile, *Luetkea pectinata* (Pursh) Kuntz, *Viola biflora* ssp. *carlottae* Calder & Taylor, *Saxifraga ferruginea* Grah., and *Isopyrum savilei* Calder & Taylor.

Maianthemum

199. Maianthemum dilatatum (Wood) Nelson & Macbr., Bot. Gaz. 61: 30. 1916.

M. bifolium var. *dilatatum* Wood, Proc. Acad. Phila. 20: 174. 1868.
M. bifolium var. *kamtschaticum* Jepson, Fl. W. Middle Calif. ed. 2. 109. 1911.

GRAHAM ISLAND: near Masset Spit, *CST21239;* Masset, *CST21286* (DAOM), Sept. 25, 1912, Green (UBC); Tlell, *CST21378, CST23242, CTS34652;* near Skidegate Village, *CST21423;* Langara Island, *CST22560,* June 1, 1952, *Guiget* (V), May 21, 1952, *Beebe* (V); Queen Charlotte City, *CST23026* (DAOM); Image Pt., *CTS34679;* 4 mi N of Oeanda River, *CT35862;* Juskatla, June 8, 1952, *Schmidt;* Port Clements, June 24, 1952, *Schmidt;* Skidegate, May 1901, *Newcombe* (V); Dawson Harbour, June 24, 1897, *Newcombe* (CAN); Marble Island, June 16, 1961, *Foster & Bigg* (UBC).

MORESBY ISLAND: Sandspit, *CST21094;* 3 mi E of Skidegate Lake, *CST21911;* Bigsby Inlet, *CST22159;* Crescent Inlet, *CTS34976;* Low Island, *CTS35009;* Mt. Moresby, *CT36496;* Yakulanas Bay, *CT36647;* near Cape Fanny, Aug. 9, 1957, *Mills;* Horn Rock, Aug. 10, 1957, *Mills;* Copper Bay, *Foster & Joslin 7* (UBC).

Maianthemum dilatatum is obviously closely related to *M. bifolium* (L.) Schmidt of Eurasia, but it differs in being a more robust plant occasionally reaching a height of 70 cm. It is completely glabrous and has broad, often abruptly acuminate-tipped leaves. In *M. bifolium* the stems, peduncles, petioles, and undersurface of the leaves are sparsely to densely short-pubescent and the leaf margins are ciliolate. Some authors have treated *M. dilatatum* at subspecific rank, but we agree with Hultén (1927, p. 250) that it should be retained as a species. Apparently the two species do not intergrade where they meet in Kamchatka. We have seen a few specimens of *M. dilatatum* that have leaves similar in shape to those of *M. bifolium,* but in any colony or large collection most of the plants have leaves of the *dilatatum* type.

This species occurs throughout the Charlottes in open coniferous woods, along forest margins, and on bluffs in the immediate vicinity of the coast, where it occasionally forms the dominant ground cover. *Maianthemum* will not tolerate the moss-carpeted closed forests that prevail throughout much of the interior of the Islands.

Streptopus

Large plants with branched stems; nodes, peduncles, and pedicels glabrous; perianth segments wide-spreading with strongly recurved tips ..... *S. amplexifolius*

Small plants with usually simple stems; nodes ciliate; perianth campanulate or rotate, the segments spreading but the tips not conspicuously recurved

Plants usually over 15 cm high; leaf margins with irregularly spaced multicellular cilia; perianth campanulate; peduncles and pedicels ciliate ..... *S. roseus*

Plants usually less than 15 cm high; leaf margins with closely crowded, unicellular, microscopic, hyaline teeth; perianth rotate; peduncles and pedicels glabrous ..... *S. streptopoides*

200. Streptopus amplexifolius (L.) DC., Fl. Fr. 3: 174. 1805.

GRAHAM ISLAND: Jungle Beach, *CST20934;* Tow Hill, *CST21197;* near Skidegate Village, *CST21426;* Empire Anchorage, *CS21455, CS21508* (in part); McClinton Bay, *CST21596, CST21659;* Lepas Bay, *CST22608;* near Haida, *CST22775;* between Ells and Mercer pts., *CST22905;* Dawson Inlet, *CST22935, CTS35085;* Shields Bay, *CT23324;* Blackwater Creek, *T53;* 1 mi W of Queen Charlotte City, *CTS34797;* Long Inlet, *CT35951;* near mouth of Kliki Creek, *CT36825;* Queen Charlotte City, July 10, 1952, *Schmidt;* Gold Creek, June 13, 1952, *Schmidt;* Skidegate, April 25 and May 1901, *Newcombe* (V); Dawson Harbour, June 24, 1897, *Newcombe* (CAN).

MORESBY ISLAND: Chaatl Narrows, *CST21798,* Newcombe Peak, *CST22035;* Bigsby Inlet, *CST22127;* Takakia Lake, *CST23056;* Mt. de la

Touche, *CT23563;* Crescent Inlet, *CTS34981;* between Cumshewa and Peel inlets, *CT35197;* Kootenay Inlet, *CT36227;* Mt. Moresby, *CT36442;* Kaisun, *CT36548;* Sunday Inlet, *CT36606;* Yakulanas Bay, *CT36648;* Lockeport, June 1, 1923, *Newcombe* (V).

In a monograph of *Streptopus* Fassett (1935) recognized seven varieties in the North American – Eurasian *S. amplexifolius*. He considered the typical phase to be restricted to the mountains of southern Europe and because we have seen only a single collection from this region we are following his treatment as far as the European plant is concerned. In North America five varieties are recognized. Two of these, var. *americanus* Schultes and var. *denticulatus* Fassett, were considered to be widely distributed in coastal British Columbia and Alaska and consequently they are pertinent to this discussion.

According to Fassett, the only differences between these varieties is that in var. *americanus* the leaf margins are entire or with minute scattered teeth not exceeding six per cm while in var. *denticulatus* the leaf margins have 10 to 20 mostly regularly distributed minute teeth per cm. In a series of about 100 collections from Alaska, British Columbia, and Alberta we checked the number of teeth per cm on at least three leaves in each collection. The number of teeth depends on the stage of development of the leaves, the portion of the leaf margin measured, and the position of the leaves on the plant. Also, as the teeth are not regularly disposed we got significantly variable counts on the same leaf. In a number of the collections some leaves are entire while others on the same plant have up to 20 teeth per cm. In approximately 20 percent of the collections examined the leaves are denticulate with about 10 or more teeth per cm of leaf margin, in roughly 45 percent the leaves are entire or with less than six teeth per cm, and the remaining 35 percent comprises plants that could not be placed with certainty in one variety or the other and would have to be considered as intermediates. Fassett was aware of the variation in western North America, but it is obvious that he did not see a large enough series from British Columbia and Alaska. In his maps showing the ranges of var. *americanus* and var. *denticulatus* it can be seen that the varieties are essentially sympatric in Alaska and British Columbia. Variety *denticulatus* appears to be restricted to the coastal region as far south as California, whereas var. *americanus* occurs in the northern Cascade Mountains and inland along and adjacent to the Rocky Mountains. A third variety, the Japanese var. *papillatus* Ohwi, was reported by Fassett from Hoona in Alaska, but the presence of this variety along the northwest Pacific coast certainly needs to be substantiated. Fassett distinguished this variety from var. *denticulatus* by its smaller perianth segments and leaves that are green rather than glaucous beneath. Such characters are extremely variable and the only Japanese collection that we have seen determined as var. *papillatus* has the abaxial leaf surfaces conspicuously glaucous.

The leaf margins are entire in 18 of the 20 collections of *S. amplexifolius* obtained in the Charlottes in 1957. The two remaining collections have 10 to 16 and 0 to 16 teeth per cm, respectively. The 1964 collections are also variable in this leaf character, and we are quite unwilling to recognize the presence of

two varieties on the Islands. We are tentatively referring the western Canadian – Alaskan population to var. *americanus*. However, we are hesitant to change its nomenclatural status until a series of plants of the typical phase from Europe has been examined.

Streptopus amplexifolius is common throughout the Queen Charlotte Islands from sea level in the lowlands to tree line in the Queen Charlotte Ranges. It is usually found along stream banks and margins of rocky runnels, or high on logs or tree stumps in coniferous woods. Although *S. amplexifolius* withstands fairly severe competition from other herbaceous species it prefers a somewhat open forest community.

201. Streptopus roseus Michx. ssp. **curvipes** (Vail) Hult., Fl. Alaska & Yukon 2: 463. 1943.

S. curvipes Vail, Bull. Torrey Club 28: 267. 1901; *S. roseus* var. *curvipes* (Vail) Fassett, Rhodora 37: 110. 1935.

GRAHAM ISLAND: about 3 mi SW of Tow Hill, *CST21329;* Empire Anchorage, *CS21508* (in part); Tan Mtn., *CST21623;* McClinton Bay, *CST-21658;* near Haida, *CST22773;* Newton Pt., *CST22970;* Shields Bay, *CT-23320;* Collinson Lake, *CT35516;* Jalun Lake, *CT35611;* Juskatla, May 30, 1952, *Schmidt;* Skidegate, June 1901, *Newcombe* (V).

MORESBY ISLAND: Takakia Lake, *CST23090,* June 16, 1960, *Foster & Joslin* (UBC); Mt. de la Touche, *CT23562;* Yatza Mtn., *CT35749;* Lockeport, June 1, 1923, *Newcombe* (V).

In a monograph of *Streptopus* Fassett (1935) discussed in detail the variation in *S. roseus,* a species confined to North America. He recognized four varieties: var. *roseus* and var. *perspectus* Fassett restricted to eastern North America, var. *longipes* (Fernald) Fassett of north-central United States and adjacent Canada, and var. *curvipes* (Vail) Fassett confined to Alaska, British Columbia, Idaho, Washington, and Oregon. The eastern varieties are readily separable from the west-coast plant, but occasional individuals in the var. *longipes* population are indistinguishable from var. *curvipes.* Fassett stated that in var. *longipes* the stems are often branched, the leaves have mostly 20 to 30 cilia per cm along the margins, and the peduncles and pedicels together are 6 to 22(-42) mm long. In contrast, var *curvipes* is stated to have stems that are usually simple, leaves with entire margins or with less than 20 cilia per cm of leaf margins, and peduncles and pedicels that together measure 5 to 15 (-20) mm long. In addition, the length of the papillae on the inner surfaces of the petals and sepals is stated to be longer in var. *curvipes,* but this is an obscure diagnostic character. We examined about 60 collections of var. *curvipes* from Alaska, British Columbia, and Washington and have found only two plants with branched stems. The number of cilia per cm along the margins of the leaves varied from about 12 to 24 and no leaves examined lacked cilia. In 14 collections of var. *longipes* two plants were unbranched, the number of cilia

per cm of leaf margin varied from about 22 to 38, and the plants were usually much more robust than those of var. *curvipes*. The combined peduncle–pedicel length is usually greater in var. *longipes,* but this is certainly not a reliable distinguishing character. The taxonomic conclusions reached by Fassett with respect to these two taxa seem reasonable even though a few individuals cannot be determined with certainty. The western ssp. *curvipes* extends southward along the Alaska coast from near the Yukon border to Oregon, and there is a somewhat disjunct population in northernmost Idaho and in the mountains of central and eastern British Columbia. It extends much farther north than indicated by Fassett (1935, Map 3).

Streptopus roseus ssp. *curvipes* is widely distributed in coniferous woods throughout the Queen Charlotte Islands from near sea level in the lowlands to tree line in the mountain ranges. On the Charlottes it rarely flowers profusely or sets fruit. Under densely shaded conditions nearly all plants are sterile and reproduce vegetatively by long-creeping rhizomes.

202. Streptopus streptopoides (Ledeb.) Frye & Rigg ssp. **brevipes** (Baker) Calder & Taylor, Can. J. Bot. 43. 1393. 1965.

S. ?brevipes Baker, Jour. Linn. Soc. Bot. 14: 592. 1875.
Kruhsea tilingii sensu Baker, op. cit., 593, in part.
K. tilingiana sensu Farr, Contr. Bot. Lab. Univ. Pa. 2: 417. 1904.
Streptopus streptopoides var. *brevipes* (Baker) Fassett, Rhodora 37: 111. 1935.

GRAHAM ISLAND: about 8 mi SSW of Juskatla, *CT35479;* Mamin River, June 6, 1952, *Schmidt;* Langara Island, May 16, 1952, *Beebe & Guiget* (V), June 1, 1952, *Guiget* (V); Skidegate, Sept. 1901, *Newcombe* (V).

MORESBY ISLAND: Mosquito Mtn., *CT23737.*

Streptopus streptopoides, which occurs sporadically east of the Coast Mountains, is quite common in wet coniferous woods along the British Columbia – Alaska coast. It has not been previously reported from east of the Rocky Mountains, but there is a recent record from the Swan Hills of western Alberta (*Pegg 1122*). The North American material for this species that we have examined is extremely uniform and quite unlike the few collections we have seen from Asia. The differences between the Asiatic and North American varieties have been discussed by Fassett (1935).

There are only six records of *S. streptopoides* for the Queen Charlotte Islands, but it is probably much more widely distributed than indicated by these scattered collections. In 1957 a few plants were found in dense coniferous woods at about 1,500 ft on the north-facing slope of Mosquito Mountain at the west end of Mosquito Lake, and in 1964 a large colony comprised mostly of sterile plants was noted in a mature hemlock stand near Juskatla. We also have a Schmidt collection from the Mamin River near Juskatla, and there are three collections from the Islands in the Provincial Museum at Victoria.

TOFIELDIA

203. Tofieldia glutinosa (Michx.) Pers., Syn. Pl. 1:399. 1805.

Testa tightly enveloping the seed ..... ssp. *glutinosa*
Testa spongy, loose and inflated, not tightly enveloping the seed ..... ssp. *brevistyla*

203a. Tofieldia glutinosa (Michx.) Pers. ssp. **glutinosa**
T. intermedia Rydb., Bull. Torrey Club 27: 528. 1900, in part.

GRAHAM ISLAND: Langara Island, *CST22524;* near Tow Hill, *CST-22698;* between Ells and Mercer pts., *CST22925;* Newton Pt., *CST22988;* Shields Bay, *CT23283;* about 3 mi NW of Tlell, *CST23485;* N of Queen Charlotte City, July 5, 1952, *Schmidt;* MacIntosh Meadows, Aug. 23, 1961, *Foster & Bigg* (DAO, UBC); Yakoun Lake, Aug. 1895, *Newcombe* (V); Dawson Inlet, Aug. 1961, *Foster & Bigg* (UBC).

MORESBY ISLAND: Chaatl Narrows, *CST21772;* White Swan Bog, *CST21941, CT35295;* Bigsby Inlet, *CST22121;* Echo Harbour, *CST22366;* Takakia Lake, *CST23093A, CT36355;* Red Mud Marsh, *CST23203B;* Mt. de la Touche, *CT23542;* Upper Victoria Lake, *CT35764;* Kootenay Inlet, *CT-36175;* Mt. Moresby, *CT36432,* 1961, *Foster & Bigg* (UBC); Sunday Inlet, *CT36619.*

203b. Tofieldia glutinosa (Michx.) Pers. ssp. **brevistyla** C. L. Hitchc., Amer. Midl. Nat. 31: 495. 1944.
T. occidentalis S. Wats., Proc. Amer. Acad. 14: 283. 1879.
T. intermedia Rydb., Bull. Torrey Club 27: 528. 1900, in part.

GRAHAM ISLAND: Yakoun Lake, *CT36769.*

MORESBY ISLAND: Red Mud Marsh, *CST23203A, CT36725.*

In a treatment of the North American *T. glutinosa* complex Hitchcock (1944) recognized five subspecies, one of which ranges from the Atlantic to the Pacific coast whereas the others are restricted to the western part of the continent. Three of these subspecies are found in British Columbia, but only ssp. *glutinosa* and ssp. *brevistyla* occur in the Queen Charlotte Islands and along the British Columbia – Alaska coast. The only significant difference between these two subspecies is in the testa: in ssp. *brevistyla* it is spongy, loose, and inflated and obscures the brownish color of the seed; in ssp. *glutinosa* it tightly envelopes the seed and does not obscure the seed color. According to Hitchcock there is a tendency for the sepals to be longer in ssp. *brevistyla,* but this character is not constant.

Tofieldia glutinosa occurs throughout British Columbia and northward along the coast of Alaska to the Kenai Peninsula with a single record from central Yukon (Halfway Lakes north of Mayo, *Calder et al. 4146*). Many of

the collections we have examined are in flower and at this stage the two subspecies cannot be separated. This is unfortunate for as a consequence we are unable to accurately define their distributions in this region. On the basis of fruiting collections in the Plant Research Institute only ssp. *brevistyla* occurs on southern Vancouver Island and the adjacent mainland. It extends eastward to the Rocky Mountain Trench, and there is an isolated record from the Rocky Mountains in Jasper National Park. In the interior it ranges northward to the central part of the province and at the coast it occurs with ssp. *glutinosa* from northern Vancouver Island to the Kenai Peninsula in Alaska. Only ssp. *glutinosa* occurs in northern British Columbia and Yukon and it extends southward to the central part of the Province and along the Rocky Mountains almost to the Montana border. The distributions of these taxa overlap in places and intermediates occur, but we agree with the delimitation of subspecies as proposed by Hitchcock.

Tofieldia glutinosa is common in lowland meadows and bogs throughout the Charlottes and occurs on open boggy slopes to tree line in the Queen Charlotte Ranges. As we have found it impossible to distinguish ssp. *glutinosa* from ssp. *brevistyla* in flower, we have arbitrarily cited all such collections under the typical phase. Subspecies *brevistyla* is apparently rare on the Islands. A number of plants of this subspecies were found in Red Mud Marsh near Sandspit in the 1957 and 1964 surveys. It occurs at this station with the typical phase, and intermediates between the two subspecies were found (*CST-23203C*). The only other certain collection of ssp. *brevistyla* is from a boggy habitat along the shoreline of Yakoun Lake. A few collections such as the ones from Mount de la Touche and Dawson Inlet are slightly atypical and tend towards ssp. *brevistyla*.

Veratrum

204. Veratrum eschscholtzii A. Gray, Ann. Lyc. N.Y. 4: 119. 1837.
V. viride sensu Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 29. 1921.

GRAHAM ISLAND: between Ells and Mercer pts., *CST22922;* Newton Pt., *CST22954;* Shields Bay, *CT23319, CT23366* (DAOM); Honna River, *CT35405, CT36937;* Blackwater Creek, *S3545* (DAOM); Skidegate, May 1901, *Newcombe* (V).

MORESBY ISLAND: 3 mi E of Skidegate Lake, *CST21921;* Bigsby Inlet, *CST22148* (DAOM); Mt. de la Touche, *CT23543* (DAOM); Skidegate Lake, *CT23672;* Mosquito Lake, *CT23707* (DAOM); between Cumshewa and Peel inlets, *CT35220;* Upper Victoria Lake, *CT35806;* Sunday Inlet, *CT36677.*

The collections of *Veratrum* from the Queen Charlotte Islands belong to *V. eschscholtzii,* which is found from Alaska and southeast Yukon south to California. The distinction between this wide-ranging western species and the eastern North American *V. viride* Ait. is rather vague. Hultén (1943*a*, p. 452)

segregates *V. eschscholtzii* from *V. viride* on the following basis: the longer and drooping branches of the inflorescence, the more pubescent leaves, and the somewhat longer stamens. The first two differences are quite subjective and the last one is not evident when a good series from both geographical areas are examined. Zimmerman (*in* Kupchan *et al.*, 1961, p. 9) states that *V. eschscholtzii* has small, oblanceolate tepals in comparison to the larger lanceolate ones of *V. viride*. The inflorescence of *V. viride* tends to be more crowded and more upright than in *V. eschscholtzii*. In addition, Kupchan indicates (*op. cit.*, p. 20) significant differences in the number and kinds of alkaloids present in each species. Our examination of their flowers has revealed a more prominent dark gland at the base of the tepals in the western *V. eschscholtzii*. Although we are accepting the segregation of the western plant at the specific level, a detailed study may well show that the western population would be better treated at subspecific rank.

In the Queen Charlotte Islands *V. eschscholtzii* occurs nearly at sea level and extends up to tree line wherever suitable habitats occur. During our survey of the Islands we were told by several different people that a "bananalike" plant grew on the west coast of both Graham and Moresby islands. This plant was said to possess very large leaves and stalks of small bananas that were inedible. *Veratrum eschscholtzii* is the only species that in any way corresponds to this description, and we did observe exceptionally large and luxuriant plants at a number of stations on the west coast.

Iridaceae

Sisyrinchium

205. Sisyrinchium littorale Greene, Pittonia 4: 33. 1899.

GRAHAM ISLAND: Rose Spit, *CST21220;* 2½ mi S of Tlell, *CST-21346;* between Skidegate and Skidegate Village, *CST21403;* Yakoun River Delta, *CST21560;* McClinton Bay, *CST21669;* Jewell Island, *CST22458;* Lepas Bay, *CST22621;* Yakan Pt., *CST22721;* Dawson Inlet, *CST22854;* Lina Island, *CST22914;* Juskatla, *S3517;* Tlell, *CTS35079;* July 4, 1925, *W. A. Newcombe* (V); near mouth of Oeanda River, *CT35893;* Yakoun Lake, *CT36756;* Masset, June 1901, *Newcombe* (V); Skidegate, June 1901, *Newcombe* (V).

MORESBY ISLAND: 2½ mi SW of Sandspit, *CST21080;* head of Cumshewa Inlet, *CST21974;* islet off Bolkus Islands, *CST22235A;* Skedans Islands, *CST22398;* Skedans, *CST22425, Foster & Joslin* (DAO, UBC); Limestone Island, *CTS34829;* Tuft Islets, *CTS34870;* Skidegate Lake, *CT-35279, Foster & Joslin 6* (UBC); Mosquito Lake, *CT35304;* Upper Victoria Lake, *CT35800;* Rose Inlet, *CT37001;* Sandspit, 1961, *Foster & Bigg* (DAO, UBC); Church Creek, *Pillsbury 335* (DAO, UBC); Kaisun, July 13, 1897, *Newcombe* (CAN, V).

In 1899 Greene described *S. littorale* based on material collected by Gorman and Howell from Yes Bay in the Alaska panhandle. From his description and our familiarity with plant distributions along the British Columbia coast this is almost certainly the plant that is widely distributed in the Queen Charlotte Islands and along the adjacent coast at least as far south as Victoria on Vancouver Island. In the same year that Greene described *S. littorale,* Bicknell (1899, p. 456) cited a number of collections of this species from the Alaska coast and in the following year he also reported (1900, p. 245) it from Oak Bay near Victoria on the basis of a Macoun collection. We have seen many collections of *S. littorale* from Vancouver Island, and we suspect its presence along the adjacent Washington coast. It is quite distinct from all other British Columbia collections of *Sisyrinchium* from east of the Coast and Cascade mountains, including plants determined as *S. idahoense* Bickn. and *S. montanum* Greene, in having broader leaves, darker purplish flowers and larger capsules. All the collections we have seen from the west coast of Vancouver Island can be referred to *S. littorale.* However, in the interior of the island and along its east coast plants of this genus are extremely variable, and there are narrow-leaved and small-flowered plants that are much like those from the drier interior parts of the province. The blue-flowered types of *Sisyrinchium* are in need of a thorough revision and until the many species proposed by Bicknell and others are carefully evaluated we are referring all broad-leaved, large-flowered coastal plants to *S. littorale.* This species usually has scapose stems with a single terminal spathe, but occasional plants have stems with one leaf-bearing node and thus appear to be related to *S. bellum* S. Wats. of California.

There are many records of *S. littorale* from the Queen Charlotte Islands, but it is rarely a common or conspicuous element of the vegetation. It occurs in many coastal habitats such as marshes, sedge meadows, cliff crevices and on sand beaches, river flats, and rock bluffs. Although essentially coastal it is found inland along the shores of Yakoun, Mosquito, and Moresby lakes, and in a number of places on the shorelines of Masset Inlet.

Orchidaceae

Plants without green leaves; roots coralloid	*Corallorhiza*
Plants with green leaves; roots not coralloid	
Leaves opposite, a single pair	*Listera*
Leaves alternate, usually more than 2	
Inflorescence single-flowered, rarely 2	*Calypso*
Inflorescence many-flowered	
Lip of flowers spurred at the base	*Habenaria*
Lip of flowers spurless	
Flowers of inflorescence spirally-ranked	*Spiranthes*
Flowers of inflorescence not spirally-ranked	
Basal leaves many, distinctly petiolate; stem leaves scalelike	*Goodyera*
Basal leaves 1-3, not distinctly petiolate; stems leafless	*Malaxis*

Calypso

206. Calypso bulbosa (L.) Oakes ssp. **occidentalis** (Holz.) Calder & Taylor, Can. J. Bot. 43: 1393. 1965.

C. bulbosa f. *occidentalis* Holz., Contr. U.S. Nat. Herb. 3: 251. 1895; *C. occidentalis* (Holz.) A. Heller, Bull. Torrey Club 25: 193. 1898.

GRAHAM ISLAND: Masset, *CST20850;* about 2½ mi S of Tlell, *CST20891;* Jungle Beach, *CST20933;* near mouth of Sangan River, *CST21141;* Tlell, *CTS34644;* 1 mi W of Queen Charlotte City, *CT35417;* Skidegate Village, May 23, 1952, *Schmidt;* N of Queen Charlotte City, July 5, 1952, *Schmidt;* Millar Creek, May 1961, *Foster & Bigg* (UBC).

MORESBY ISLAND: between Sandspit and Cape Chroustscheff, *CST-20985;* Limestone Island, May 1901, *Newcombe* (V).

Calypso bulbosa, a rare species throughout much of its North American range, is one of the most common orchids in British Columbia both at the coast and in the interior. The North American population consists of two well-defined subspecies and in Canada, at least, these two races have distinct ranges. The western ssp. *occidentalis* is confined to coastal British Columbia west of the crest of the Cascade and Coast mountains. The more widely distributed eastern plant extending from Newfoundland to Yukon, central Alaska and the east slope of the British Columbia Coast Mountains is referred to the typical phase though we believe it may also represent a distinct race. The two subspecies in North America can be readily distinguished as follows:

Apronlike appendage of the lip, the three longitudinal rows of hairs at its base, and the apex of the sac below, all bright yellow ..... ssp. *bulbosa*

Apronlike appendage of the lip, the three longitudinal rows of hairs at its base, and the apex of the sac below, all white ..... ssp. *occidentalis*

There are also a number of other minor differences. In ssp. *occidentalis* the hairs of the beard are always unpigmented, the apronlike appendages have conspicuous dark purple-madder, circular or elliptical markings; the saccate lip is usually more slender, and the beard has fewer hairs in comparison to the typical phase. As Heller (1898, p. 193) has pointed out, the lip of ssp. *occidentalis* is usually longer, but we do not agree with his statement that the hairs are straighter, longer, and more slender. In contrast, the apronlike appendages in ssp. *bulbosa* are unpigmented except for a few purplish hairs that arise from deep purple-madder spots near the distal ends of each row of hairs, and the purplish markings at the base of the lip are brighter in this subspecies.

We do not know if the eastern North American race is similar to the Eurasian population as we have seen only a few sheets from the Old World and detailed descriptions of the coloration of the lip and beard are lacking in most floras. Seven collections including specimens from Sweden, Finland, and the Urals in USSR were examined. All collections were made many years ago and

the colors of the hairs and markings on the lips have faded, yet they do not appear to have had the bright golden-yellow hairs that are so characteristic of the eastern North American *C. bulbosa*. They also lack the purplish-pigmented hairs and deep purple-madder spots on the apronlike appendages, and their lips appear to be less brightly pigmented. Dr. Leslie A. Garay (pers. comm.) kindly examined a series of collections in the Oakes Ames Orchid Herbarium at Harvard and found that specimens from Finland, the Urals and Caucasus have white hairs while others from Sweden and elsewhere in USSR have yellow hairs with purple spots. In *Flora URSS,* Nevski (1935, p. 605) states that the saclike part of the lip is whitish or yellowish, mottled with reddish-brown streaks and spots and with yellowish hairs at the base. He considers the North American plant to be a distinct species differing in its more darkly mottled lip. Dr. Ilkka Kukkonen (pers. comm.) of the University of Turku has informed us that this university has about 20 Finnish collections and at least a few of them have plants with yellowish hairs on the lips. He mentions that it is quite possible they are always yellowish as is stated in their local floras. It is obvious that no accurate comparison can be made between the Old and New World populations until a large series of well-preserved Eurasian collections is studied.

On the Queen Charlotte Islands ssp. *occidentalis* is restricted to the more open, relatively dry, lowland spruce–hemlock forests of eastern Graham and northeastern Moresby islands. It extends northward to the Alaska panhandle, but Hultén (1943*a,* p. 494) did not recognize this subspecies in his *Flora of Alaska and Yukon*. We strongly suspect that all the collections he cited under Eastern Pacific Coast District should be referred to this subspecies.

Corallorhiza

207. Corallorhiza maculata Raf. ssp. **mertensiana** (Bong.) Calder & Taylor, Can. J. Bot. 43: 1393. 1965.

C. mertensiana Bong., Mém. Acad. St. Pétersb. VI. 2: 165. 1832.

GRAHAM ISLAND: Empire Anchorage, *CS21480;* McClinton Bay, *CST21567;* near Skidegate, *CST21683;* about 9 mi E of Masset, *CST22819;* Dawson Inlet, *CST22931;* Jungle Beach, *CT35448;* near junction of Yakoun River and Ghost Creek, *CT35510;* Collinson Lake, *CT35519;* about 4 mi N of mouth of Oeanda River, *CT35877;* Long Inlet, *CT35969;* mouth of Honna River, *CT36924;* Queen Charlotte City, July 7, 1952, *Schmidt;* Masset, 1901, *Newcombe* (V).

MORESBY ISLAND: about 2½ mi E of Skidegate Lake, *CST21909;* Sandspit, *CST23214;* mouth of Deena River, *CT23766;* Kitgoro Inlet, June 30, 1897, *Newcombe* (CAN).

The relationship of *C. maculata* Raf. and *C. mertensiana* Bong. has never been carefully analyzed as sufficient material from one of the most critical areas, British Columbia, has only recently become available for study. Over the

past ten years much material from this area has been accumulated through concentrated field surveys. We have always had difficulty in determining the taxonomic disposition of these two closely related taxa in western Canada. As a result of our studies we treat *C. mertensiana* as a subspecies of the wide-ranging *C. maculata.* Previous authors have demarcated the two taxa on the basis of a number of weak characters that cannot consistently be used to distinguish the two entities. Correll (1950), Abrams (1940), Munz (1959), and Szczawinski (1959) have all stressed that the distinctive white coloration of the lip with purple spotting can be used to distinguish *C. maculata* from *C. mertensiana,* which possesses a reddish-purple-spotted lip. This is not a consistent character as some collections of *C. mertensiana* can be found that possess no spotting or mottling on the lip. The degree of lobing of the lip is also quite variable. The western ssp. *mertensiana* cannot be characterized by an entire lip as stated by Abrams, because, as Correll (1950, p. 326) has pointed out, it may be entire in ssp. *maculata.* Hultén (1943*a,* p. 491) noted that Abram's illustration is incorrect and stated that the presence of spotting and coloration is not a good character to use in distinguishing the two races. Thus, the use of lip shape and coloration as diagnostic characters are of little value.

We have carefully examined all our North American material and believe that the two subspecies may be distinguished as follows:

Sepals and petals not wide-spreading or reflexed; mentum gibbous only, less than 1 mm long; dorsal sepal 5.5-9.5 mm long; column usually curved, 3.5-5.5 mm long ..... ssp. *maculata*

Sepals and petals wide-spreading, the lateral sepals usually reflexed downwards; mentum saccate and pointing backwards, more than 1 mm long; dorsal sepal 8-12 mm long; column upright, 6-8mm long ssp. *mertensiana*

Corallorhiza maculata ssp. *mertensiana* is found in the wet coastal belt from the Alaska panhandle south to Del Norte and Humboldt counties in northern California. In British Columbia it is found on the Queen Charlotte Islands and in the adjacent Prince Rupert region, on the west coast of Vancouver Island and in the wet coniferous woods of the adjacent mainland Coast Mountains and in an isolated pocket of the Revelstoke and North Kootenay districts. In the United States it is reported from northwestern Montana, northern Idaho, Washington, and northern Oregon. Subspecies *maculata* occurs in the north-central and in the southeastern dryland interior of British Columbia and extends south to California and east to the Atlantic coast. It is quite abundant in the dry woods of southeastern Vancouver Island.

The Queen Charlotte Island material shows the usual variation in spotting and coloration of the lip and there are occasional unpigmented flowers, a phenomenon that occurs throughout the range of ssp. *mertensiana. Corallorhiza maculata* is a widely distributed species of the lowland coniferous forests in the Charlottes.

Goodyera

208. Goodyera oblongifolia Raf., Herb. Raf. 76. 1833.

Peramium decipiens (Hook.) Piper, Contr. U.S. Nat. Herb. 11: 208. 1906; *Epipactis decipiens* (Hook.) Ames, Orchidaceae 2: 261. 1908.

G. oblongifolia var. *reticulata* Boivin, Can. Field-Nat. 65: 20. 1951.

GRAHAM ISLAND: near Masset Spit, *CST22786;* Haida Pt., *CST-23451, CT36679;* 1 mi W of Queen Charlotte City, *CT35416;* Queen Charlotte City, July 7, 1952, *Schmidt;* Yakoun Lake, Aug. 1895, *Newcombe* (V); Skidegate, Aug. 1901, *Newcombe* (V).

MORESBY ISLAND: Gray Bay, *CST23430;* Deena River, *CT23767.*

Goodyera oblongifolia is a remarkably uniform species throughout most of North America. A western segregate, var. *reticulata,* characterized by a white reticulate leaf pattern has been described by Boivin (1951). The description of this variety is based on material from three localities in British Columbia. We have examined approximately 30 collections of *G. oblongifolia* from British Columbia and have carefully observed this species in the field. Color of the leaf patterning varies from green to white in individual colonies. Garden transplant studies have revealed that this variation is found within ramets of the same clone. Clearly the green or white color of the reticulation pattern should be considered as part of the normal variation within *G. oblongifolia* and we do not recognize the varietal segregate *reticulata.*

Goodyera oblongifolia is a late-flowering species found only in the relatively dry coniferous woods in the lowland coastal areas of eastern Graham and northeastern Moresby islands.

Habenaria

Plants with one or two basal or suprabasal leaves; stems ebracteate or with a single bract; flowers green, lip ovate to suborbicular ..... *H. chorisiana*

Plants with leafy stems or, if with a pair of basal or suprabasal leaves, the flowers neither green nor the lip ovate to suborbicular

Plants with two or three basal leaves; stems bracteate; flowers greenish white ..... *H. unalascensis*

Plants with leafy, ebracteate stems; flowers white or green

Flowers white, sweet-scented; lip dilated at the base *H. dilatata*

Flowers green, odorless, lip essentially linear ..... *H. saccata*

209. Habenaria chorisiana Cham., Linnaea 3: 31. 1828.

GRAHAM ISLAND: Langara Island, *CST22516;* Newton Pt., *CST-22965;* Shields Bay, *CT23299.*

MORESBY ISLAND: Chaatl Narrows, *CST21766A;* Newcombe Peak, *CST22013;* Bigsby Inlet, *CST22120;* Echo Harbour, *CST22359;* Takakia Lake, *CST23080, CT36277;* Mosquito Mtn., *CT23752;* Upper Victoria Lake, *CT35755;* Kootenay Inlet, *CT36193;* Mt. Moresby, *CT36506;* Sunday Inlet, *CT36637.*

Habenaria chorisiana, which is based on a collection from Unalaska, was reported by Hultén in 1943 from two widely disjunct areas in Alaska, Douglas Island off Juneau in the northern part of the Alaska panhandle, and the islands of Atka, Agattu, Attu, Kiska and Unalaska in the Aleutian Chain. Later, Correll (1950, p. 64) in his treatment of the orchids of North America reported it from two additional stations, Juneau in the Alaska panhandle and Ucluelet on the west coast of Vancouver Island. Although this species is rare throughout most of its North American range a number of new stations have been found in recent years. In addition to the collections cited from the Queen Charlotte Islands it was found by Szczawinski (pers. comm.) near Prince Rupert and by Calder and MacKay during a survey of Vancouver Island and its adjacent islands in 1961: along Kennedy River between Alberni and Tofino, *Calder & MacKay 30629;* south of Roller Bay, Hope Island, *Calder & MacKay 31206;* Wreck (Florencia) Bay near Ucluelet, *Calder & MacKay, 31946.*

Hultén (1927, p. 263) originally considered the Kamchatka plant, which is closely related to *H. chorisiana,* to be a distinct species *Platanthera* (*Habenaria*) *ditmariana* Kom., but later in *Flora of the Aleutian Islands* (1937, p. 138) stated that it "is hardly anything else but a high grown variety of *P. chorisiana.*" In *Flora of Alaska and Yukon* (1943*a,* p. 475) he considered the Asiatic population of *H. chorisiana,* which ranges from southern Kamchatka south to Honshu, to comprise two races, var. *chorisiana* and var. *elata* Finet (=*P. ditmariana*). We have not seen any Asiatic material of this species, but the plant illustrated in plate 4, volume 1, of Hultén's flora of Kamchatka does not match the series of specimens of *H. chorisiana* we have seen from British Columbia. In the Queen Charlotte Islands this species ranges from 7 to 26 cm in height, its stems are scapose with a single basal leaf or pair of subopposite basal leaves, and its spicate racemes are few-flowered. The Asiatic var. *elata* also has a pair of subopposite leaves, but these are attached near the middle of the stem. It is reputedly a taller plant and its spicate racemes are many-flowered and apparently denser.

This species occurs on mossy banks in open coniferous woods and on open boggy slopes from sea level to tree line in the Queen Charlotte Ranges. It was also found in a sphagnum bog on low-lying Langara Island north of its main range in the mountainous areas. This suggests that its distribution is probably continuous from north to south throughout the western sections of Graham and Moresby islands.

210. Habenaria dilatata (Pursh) Hook., Exot. Fl. 2: *pl.* 95. 1824.
H. dilatata var. *angustifolia* Hook., Fl. Bor.-Amer. 2: 198. 1838.
H. graminifolia (Rydb.) Henry, Fl. South. B.C. 92: 1915.
H. leptoceratitis (Rydb.) Henry, *l.c.*
H. leucostachys sensu Henry, *op.cit.* 93.

GRAHAM ISLAND: 6 mi SE of Port Clements, *CST22080, CST22822;* near Tow Hill, *CST22701;* between Ells and Mercer pts., *CST22900;* Newton Pt., *CST22968;* Shields Bay, *CT23275;* MacIntosh Meadows, August 23, 1961, *Foster & Bigg* (UBC); Yakoun Lake, Aug. 1895, *Newcombe* (V); near Skidegate, July 25, 1897, *Newcombe* (V).

MORESBY ISLAND: White Swan Bog, *CST21940;* Bigsby Inlet *CST-22168;* Echo Harbour, *CST22363;* Takakia Lake, *CT23070;* Upper Victoria Lake, *CT35729;* Kootenay Inlet, *CT36181;* Mt. Moresby, *CT36501;* Sunday Inlet, *CT36595;* Kaisun, July 13, 1897, *Newcombe* (CAN).

In a treatment of the North American Orchidaceae Correll (1950) recognized three varieties of *H. dilatata*: the typical phase, var. *albiflora* (Cham.) Correll, and var. *leucostachys* (Lindl.) Ames. He reported all three varieties from British Columbia and distinguished them as follows:

Flowers with cylindrical spurs 10-20 mm long and 1½ to more than twice as long as the lip ..... var. *leucostachys*
Flowers with cylindrical spurs 5-10 mm long and about equaling the lip in length ..... var. *dilatata*
Flowers with saccate to clavate spurs usually about 2/3 the length of the lip ..... var. *albiflora*

After an examination of approximately 150 collections from Alaska, Yukon and British Columbia, we find it impossible to segregate the northern material into these three varieties because the shape of the spur and the lip: spur length ratio are so variable. Measurements were made on 60 flowering collections from mainland British Columbia and Vancouver Island with the following results. The spurs range from 5 to 9 mm in length and vary from 2/3 to twice the length of the lips, which are 4 to 10 mm long. On the basis of spur length none of these collections would be referred to var. *leucostachys,* yet their flowers frequently have the lip:spur length ratio recognized by Correll for this variety. In most specimens examined the spurs are about as long as the lip or 1/3 longer. Although most plants have flowers with cylindrical spurs a few are saccate- to clavate-spurred. There is, however, no sharp line of demarcation between the cylindrical- and clavate-spurred types and consequently we do not recognize var. *albiflora.* The long-spurred var. *leucostachys* is apparently confined to the United States and is especially common in Oregon and California. Plants from Eastern Canada are often smaller flowered than plants from British Columbia, but we have found no characters that will consistently separate the eastern and western populations.

On the Queen Charlotte Islands *H. dilatata* has flowers with spurs and lips ranging from 6 to 11 mm and 5 to 9 mm in length respectively, and the lip:spur length ratio averages a little greater than in plants from elsewhere in British Columbia. All collections from the Charlottes that are narrow-leaved would be referred by Hultén (1943*a,* p. 477) to var. *angustifolia* Hook. This variety is merely a narrow-leaved phase with spurs slightly longer than the lips and in our view only represents an extreme in a variable species and consequently does

not merit formal recognition. Such specimens occur throughout British Columbia, in both lowland and subalpine habitats, and elsewhere in Canada.

Habenaria dilatata is widely distributed throughout the lowlands and mountainous areas of the Charlottes in and along the margins of bogs and marshes and on grassy slopes. This species with its pungent, sweet-perfumed flowers is aptly called scent bottle in Newfoundland.

211. Habenaria saccata Greene, Erythea 3: 49. 1895.
H. stricta (Lindl.) Rydb., Bull. Torrey Club 24: 189. 1897.
Platanthera stricta var. *gracilis* (Lindl.) Hult., Fl. Alaska & Yukon 3: 483. 1943.

GRAHAM ISLAND: Tan Mtn., *CST21594;* near Skidegate Village, *CST21684;* Langara Island, *CST22515;* near Tow Hill, *CST22707;* Newton Pt., *CST22969;* Shields Bay, *CT23288;* 9 mi S of Juskatla, *T7;* Jalun Lake, *CT35620;* Yakoun Lake, Aug. 1895, *Newcombe* (V); near Skidegate, July 25, 1897, *Newcombe* (V).

MORESBY ISLAND: Chaatl Narrows, *CST21794;* Newcombe Peak, *CST22012;* Bigsby Inlet, *CST22151, CTS34889;* Takakia Lake, *CST23139, CT36300, Foster & Joslin 47* (DAO, UBC); Mt. de la Touche, *CT23577;* Upper Victoria Lake, *CT35788;* Kootenay Inlet, *CT36161;* Mt. Moresby, *CT36502;* Tasu Sound, June 1901, *Newcombe* (V).

Habenaria saccata is widely distributed throughout southern and central British Columbia from Vancouver Island to the Rocky Mountains and northward along the coast to the Gulf of Alaska. Coastal plants usually have open elongate inflorescences of dark-green flowers that have long linear lips, but east of the Coast Mountains many collections are difficult to place accurately as introgression has taken place with *H. hyperborea* (L.) R. Br. This latter species has short congested inflorescences of yellowish-green flowers with short, lanceolate to more or less linear lips. Although Szczawinski (1959, p. 47) records *H. hyperborea* from Vancouver Island and the adjacent mainland we have not seen any collections of this species in the many coastal collections of *Habenaria* that we have examined.

In *H. saccata* the spurs of the flowers are strongly clavate to scrotiform or occasionally narrowly cylindrical. Hultén in *Flora of Alaska and Yukon* considered that plants with essentially "filiform" (narrowly cylindrical) spurs should be formally recognized as *Platanthera stricta* var. *gracilis,* and stated that such plants may have arisen by hybridization between saccate-spurred *P. stricta* Lindl. (=*H. saccata*) and filiform-spurred *P. laxiflora* (=*H. sparsiflora* var. *laxiflora* (Rydb.) Correll). However, after carefully examining the flowers of about 100 collections of *H. saccata* from the Pacific Northwest we cannot support the recognition of two taxa on the basis of spur type. There is apparently no justification for the recognition of var. *gracilis,* and Hultén's hypothesis as to the origin of the cylindrical-spurred types is mere conjecture.

Habenaria saccata is found throughout both the mountainous and lowland regions of the Queen Charlotte Islands. It is common in marshes, bogs, and wet



Figures 114–115. *Habenaria unalascensis* (Spreng.) S. Wats. ssp. *maritima* (Greene) Calder & Taylor. 114. Habit (× ½). 115. Flower (× 3½).

mossy places in open coniferous forests and in the Queen Charlotte Ranges it extends to healthy slopes and runnels a short distance above tree line. This species and the closely related *H. dilatata* (Pursh) Hook. were found growing together in many bogs, but there is no evidence that these species hybridize in the Charlottes.

212. Habenaria unalascensis (Spreng.) S. Wats., Proc. Amer. Acad. 12: 277. 1877.

Racemes congested, densely-flowered and usually sub-pyramidal; flowers conspicuously whitish with a sweet pungent odor; spur about 2½-3½ times as long as the lip	ssp. *maritima*
Racemes usually elongate, open-flowered and essentially cylindrical; flowers greenish (rarely whitish) with no odor	
Spur about the same length as the lip or a little longer	ssp. *unalascensis*
Spur about 3-4 times as long as the lip	ssp. *elata*

212a. Habenaria unalascensis (Spreng.) S. Wats. ssp. **unalascensis**
H. unalascensis (Spreng.) S. Wats. var. *unalascensis*

GRAHAM ISLAND: Dawson Inlet, *CST22833*.

212b. Habenaria unalascensis (Spreng.) S. Wats. ssp. **maritima** (Greene) Calder & Taylor, Can. J. Bot. 43: 1393. 1965. **Figures 114 and 115.**
H. maritima Greene, Pittonia 2: 298. 1892; *H. unalascensis* var. *maritima* (Greene) Correll, Leafl. West. Bot. 3: 247. 1943.
H. michaelii sensu Henry, Fl. South. B.C. 91: 1915.

GRAHAM ISLAND: Jewell Island, *CST22457A;* Haida Pt., *CST23452, CT36680;* Torrens Island, *CT35820;* Skidegate, July 1897, *Newcombe* (V); Long Inlet, July 27, 1897, *Newcombe* (CAN).

In his treatment of the Orchidaceae of North America, Correll (1950) considers the widely distributed *H. unalascensis* of southern and central British Columbia to comprise three races: var. *unalascensis,* var. *maritima* (Greene) Correll, and var. *elata* (Jepson) Correll. All three varieties, which we treat as subspecies, occur in the province, but only two occur on the Queen Charlottes.

This species is rare in the Queen Charlotte Islands and is represented only by the typical phase and ssp. *maritima.* In mid-July 1957 a single immature plant of ssp. *maritima* was found along the edge of a runnel on a rocky bluff on Jewell Island off Skidegate Village and another plant was noted on the same date in a similar habitat on nearby Torrens Island. The Jewell Island plant was transplanted to a suitable spot near our lodgings at Queen Charlotte City and it came into full bloom about August 1. An extensive but scattered flowering colony was found later in August in grassy pockets along rock bluffs at Haida

Point along the shores of Skidegate Inlet. No new stations were located in the 1964 survey, but there is an 1897 Newcombe collection from Long Inlet at the west end of Skidegate Inlet. All records are from the relatively dry southeast corner of Graham Island in a region of relatively low rainfall. The only other area where ssp. *maritima* is likely to occur on the Charlottes is on bluffs along the east coast of Moresby Island and some of its small offshore islands. This coastal species, which has pungent, sweet-scented flowers reminiscent of *H. dilatata,* has inconspicuous green petals and showy white sepals with green midnerves. It is a robust plant with a conspicuously congested inflorescence quite unlike the other two subspecies. The only other collection we have seen from British Columbia is from Reay Island (*Calder & MacKay 33223*) near Sydney on the south coast of Vancouver Island. Henry's (1915, p. 92) report of *H. michaelii* from "grassy places under oaks" at Victoria probably refers to this species.

The only collection of ssp. *unalascensis* from the Charlottes is represented by a single specimen that was found in a grass–sedge runnel in coniferous woods at the shoreline at the north end of Dawson Inlet. This plant had flowers with whitish sepals like ssp. *maritima,* but its open, cylindrical inflorescence and odorless flowers with smaller floral parts and short spur are characteristic of the typical phase. Plants of ssp. *unalascensis* with whitish flowers are rare in British Columbia and usually occur in the coastal belt.

We can find no consistent differences between ssp. *unalascensis* and ssp. *elata* except in the ratio of the length of the spur to the lip. In the latter subspecies there is a tendency for the raceme to be more densely flowered, its floral parts are usually larger, and it is often a more robust plant, especially along the southeast coast of Vancouver Island, which apparently is the only area in the province where it occurs in any abundance.

Listera

Racheae glandular-puberulent; lips cuneate, retuse at apex with a mucro in the sinus; flowers green ..... *L. caurina*

Racheae glabrous; lips linear-oblong, deeply cleft into linear-lanceolate lobes; flowers green or purple ..... *L. cordata*

213. Listera caurina Piper, Erythea 6: 32. 1898.

GRAHAM ISLAND: near Skidegate, *CST21682;* Langara Island, *CST-22522;* near Masset Spit, *CST22774;* Dawson Inlet, *CST22829;* between Lawn Pt. and Tlell, *CST23267;* Shields Bay, *CT23302;* Long Inlet, *CT35970;* N of Queen Charlotte City, July 5, 1952, *Schmidt;* Queen Charlotte City, July 10, 1952, *Schmidt.*

MORESBY ISLAND: below Newcombe Peak, *CST22011;* Bigsby Inlet, *CST22171;* Harriet Harbour, *CST22266;* Echo Harbour, *CST22377;* Mt. de la Touche, *CT23561;* Anna Inlet, *CTS34940;* Kootenay Inlet, *CT36224;* Sunday Inlet, *CT36613.*

Listera caurina, which is widely distributed west of the Coast Mountains in British Columbia, has been recorded to about 59°N in the Alaska panhandle. There is an Unalaska record, which has been queried by Hultén (1960, p. 154), that needs verification.

This species occurs throughout the lowlands of the Charlottes on mossy slopes and banks in the moist, dense coniferous forests. It was first collected in flower in the latter part of June and it blooms well on into August on forested slopes of the Queen Charlotte Ranges to at least 1,500 ft. It is often associated with *L. cordata* (L.) R. Br. but usually flowers from two to three weeks later. A Newcombe collection from Tasu Harbour, which was reported by Carter and Newcombe (1921, p. 31) as *L. convallarioides* (Sw.) Nutt., should be referred to this species.

214. Listera cordata (L.) R. Br. in Ait., Hort. Kew. ed. 2. 5: 201. 1813.

L. nephrophylla Rydb., Mem. N.Y. Bot. Gard. 1: 108. 1900; *L. cordata* var. *nephrophylla* (Rydb.) Hult., Aleut. Is. 145. 1937.

GRAHAM ISLAND: Masset, *CST20849;* near mouth of Sangan River, *CST21142;* 5 mi S of Masset, *CST21280;* Empire Anchorage, *CS21511;* near Skidegate Village, *CST21686;* Langara Island, *CST22521;* Shields Bay, *CT-23321;* about 10 mi SSE of Juskatla, *T15;* 9 mi N of Port Clements, *CTS34708;* Jalun Lake, *CT35618,* about 4 mi N of mouth of Oeanda River, *CT35875;* Juskatla, May 31 and June 7, 1952, *Schmidt;* Yakoun Lake, Aug. 1895, *Newcombe* (V); Skidegate, June 1901, *Newcombe* (V); Tlell River, July 1914, *Green* (UBC).

MORESBY ISLAND: head of Cumshewa Inlet, *CST21041;* Chaatl Narrows, *CST21775;* Bigsby Inlet, *CST22137;* Upper Victoria Lake, *CT35807;* Kootenay Inlet, *CT36222;* Takakia Lake, *CT36354;* Tasu Sound, June 2, 1901, *Newcombe* (V); Mt. Moresby, Aug. 1961, *Foster & Bigg* (UBC).

In 1900 Rydberg described the western North American population of *L. cordata* as a distinct species *L. nephrophylla.* He stated that possibly all specimens from the Rocky Mountains belonged to this new species and he cited collections from Alaska, British Columbia, Washington, Oregon, Idaho, Montana, Wyoming, and Colorado. He believed that *L. nephrophylla* differed from the eastern North American and European plant in having broader reniform and more strongly reticulate leaves; larger, green rather than purple, flowers with broader sepals and petals; the basal divergent teeth of the lips directed backward not forward; and the stamens strongly incurved rather than ascending. Hultén, in *Flora of the Aleutian Islands* (*loc. cit.*) and *Flora of Alaska and Yukon* (1943*a,* p. 488), recognized Rydberg's taxon but treated it as a variety of *L. cordata.* He stated that this variety in comparison with Scandinavian plants has leaves that are broader and more rounded at their apices and have a greater width:length ratio. He also believed that the pedicels are on the average longer in var. *nephrophylla.* We have collected *L. cordata* on about 60 occasions in Alaska, Yukon, and British Columbia over the past 15 years and have carefully

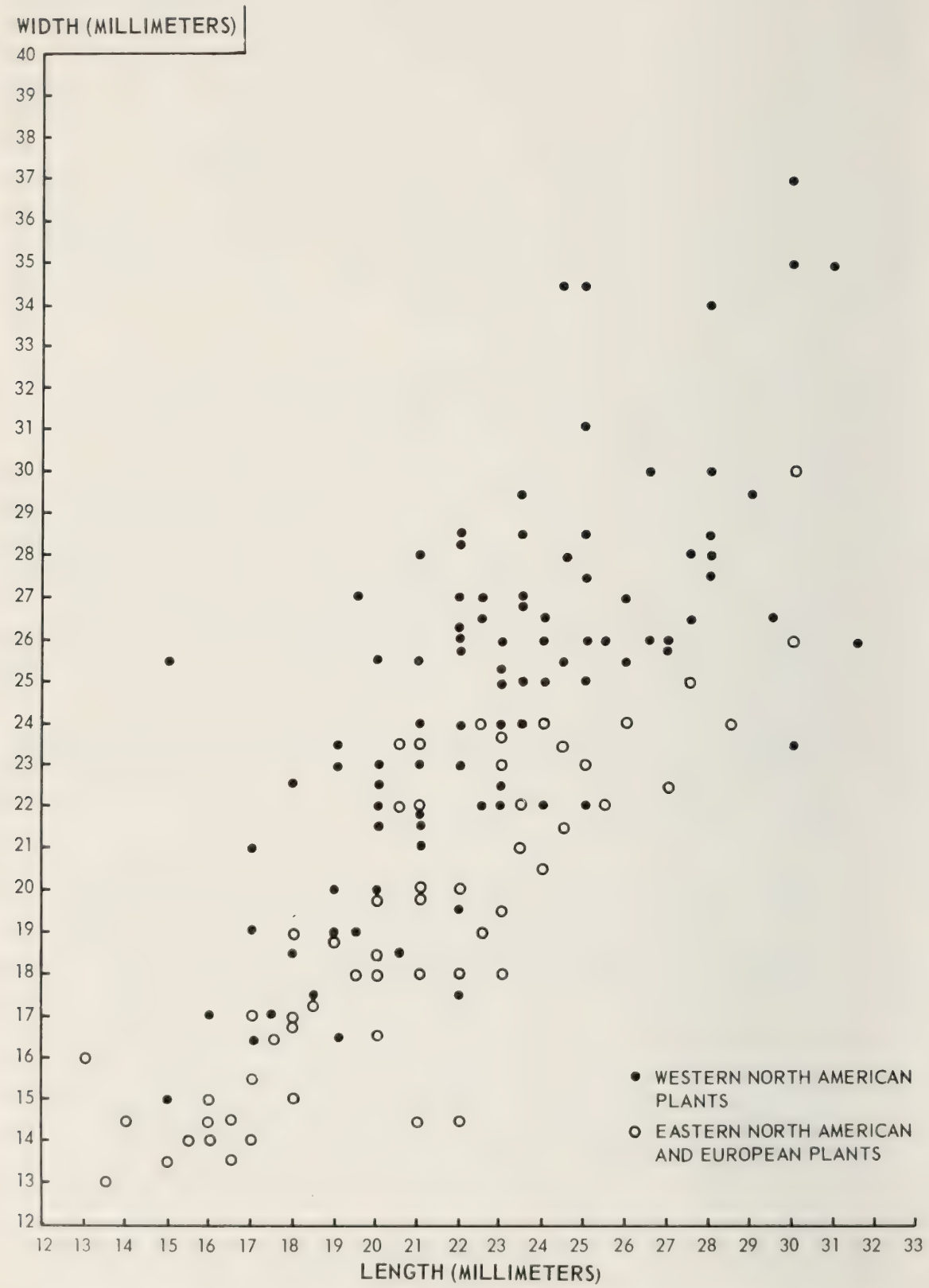


Figure 116. Scatter diagram of the length and width of the largest leaves in a series of collections of *Listera cordata* (L.) R. Br.

observed this species in the field. In addition, a total of about 170 collections from Europe and North America have been examined. All the morphological characters except leaf shape, which Rydberg considered as diagnostic for the recognition of *L. nephrophylla,* break down when a large series of specimens is examined. Flower color is of little significance as both dark-purple- and green-flowered plants are often found in the same colony. Although Rydberg stated that the Cordilleran *L. nephrophylla* has greenish flowers, it is usually purple-flowered whereas plants from eastern North America and Europe usually have green flowers. Dr. I. Kukkonen (pers. comm.) has informed us that both color phases occur throughout Finland and that they are often found together in the same colony. Szczawinski (1959, p. 71) contends that green-flowered plants occur mainly in the northern interior of British Columbia while the dark-purplish-flowered phase is more common on the southeast coast of Vancouver Island and in the southwest interior of the province. In our experience there is no geographic pattern exhibited by either of these two color forms.

However, on the basis of leaf shape, it is possible to readily distinguish many western North American collections from plants of the European and eastern North American populations, but as can be seen in the scatter diagram (Figure 116) the patterns based on leaf measurements show a significant overlap that we feel is too high to warrant retention of *nephrophylla* as a distinct taxon. In this diagram we have plotted the lengh and width of the largest leaf in 147 collections; 93 from western North America and 54 from eastern North America and Europe. Most of the Cordilleran plants have leaves broader than long in contrast to plants from Europe and eastern North America, which have leaves usually longer than broad. About 50 percent of the 93 western Cordilleran collections examined fall within the leaf measurements of the eastern North American and European populations.

Listera cordata is common throughout the lowlands of the Queen Charlotte Islands in both open and dense coniferous forest. It is one of the few species that will grow and flower profusely under the densely shaded conditions of the mature Sitka spruce – western hemlock forest. It also occurs on forested slopes in the Queen Charlotte Ranges to at least 2,000 ft. Most of the colonies observed had both green- and purple-flowered plants.

Malaxis

215. Malaxis paludosa (L.) Sw., Vet.-akad. Stockholm Nya Handl. 21: 235. 1800.
Ophrys paludosa L., Sp. Pl. 2: 947. 1753.

GRAHAM ISLAND: SW of Tow Hill, *CST22700;* about 3 mi NW of Tlell, *CST23482, CT36111.*

MORESBY ISLAND: Red Mud Marsh, *CST23184;* White Swan Bog, *CT23665;* Kootenay Inlet, *CT36182.*

Malaxis paludosa is a rarely collected species in North America, yet we strongly suspect that its distribution is not as discontinuous as the few scattered records indicate. Before 1957 we had only found this species in British Columbia in a small bog along the road between Prince Rupert and Galloway Rapids (*Calder, Savile & Ferguson 13207*) near the coast. The only other records for the province are from Aleza Lake near Prince George and Liard Hotsprings on the Alaska Highway.

Malaxis paludosa is usually a difficult plant to spot in the field as the basally clustered leaves are often well hidden below the surface sphagnum layers and only the short-peduncled, inconspicuous racemes are evident. A number of the extensive lowland sphagnum bogs of eastern Graham and northeastern Moresby islands were carefully checked in the 1957 survey and five stations were located. The finding of only five plants by three people in a half-hour search of the extensive bogs near Tow Hill gives some indication of the rarity of this species on the Islands. In the same year a few large colonies containing unusually tall plants (up to 15 cm) were located in Red Mud Marsh south of Sandspit. All records from the Charlottes are from the eastern lowlands, with the exception of the Kootenay Inlet station where a single plant was found below Mount Russ on open, boggy slopes at about 600 ft.

Spiranthes

216. Spiranthes romanzoffiana Cham. & Schlecht., Linnaea 3: 32. 1828.

GRAHAM ISLAND: about 2 mi E of Tow Hill, *CST22749;* Masset Spit, *CST22795, CT36920;* Tlell, *CST23172, CT36885;* Image Pt., *CST23257;* 2½ mi S of Jungle Beach, *CT36697;* Yakoun Lake, *CT36751;* N of Skidegate, July 21, 1897, *Newcombe* (V); Masset, Sept. 8, 1902, *Newcombe* (V); MacIntosh Meadows, Aug. 23, 1961, *Foster & Bigg* (UBC).

MORESBY ISLAND: Red Mud Marsh, *CST23204;* Skidegate Lake, *CT23627.*

Spiranthes romanzoffiana is quite common in meadows and marshy bogs, and on grassy bluffs near the coast. All the records cited are from the lowlands of eastern Graham and northeastern Moresby islands. In the National Museum at Ottawa there are two collections from the Islands without exact locality: July, 1878, *Dawson;* west coast, July 26, 1897, *Newcombe.*

Salicaceae

Salix

Prostrate shrubs; alpine	*S. reticulata*
Upright shrubs or trees; lowland	
Leaves distinctly serrate; bracts of flowers not persistent in fruit	*S. lasiandra*

Leaves entire; bracts of flowers persistent in fruit
Leaves silvery tomentose on abaxial surface; stamen 1 ..... *S. sitchensis*
Leaves densely villous-tomentose or reddish- to whitish-pubescent or glaucous on abaxial surface; stamens 2
Leaves reddish- to whitish-pubescent or glaucous on abaxial surface; capsules densely short-pubescent ..... *S. scouleriana*
Leaves densely villous-tomentose on abaxial surface; capsules glabrous or sometimes distally villous ..... *S. hookeriana*

217. Salix hookeriana Barratt in Hook., Fl. Bor.-Amer. 2: 145. 1838.

MORESBY ISLAND: Upper Victoria Lake, *CT35743*.

Salix hookeriana is a common plant of coastal habitats from California to Vancouver Island and the adjacent lower mainland of British Columbia. A variety, var. *tomentosa* Henry ex Schneider, was based on specimens with pubescent ovaries, but there is some question as to whether the ovaries of the original plants on which Barratt based *S. hookeriana* were not also pubescent (*see* Bebb, 1889 and 1890). The holotype of this species was apparently not designated and Barratt's description was probably based on a Scouler collection from the Pacific coast and a Douglas record from the Saskatchewan River. Barratt's original description states that the ovaries are glabrous, but as Bebb has pointed out the ovaries of the collections were overmature and he further indicates that all collections he has seen had pubescent capsules. We have found that the degree of pubescence may vary depending upon the stage of development and maturity of the ovary. Until a detailed study involving examination of type material is undertaken and a lectotype is selected, we are tentatively referring the Queen Charlotte Island collection to *S. hookeriana* and not recognizing any infraspecific taxa.

The occurrence of this willow on the Queen Charlotte Islands is not surprising as a number of coastal species that had been known previously along the Pacific coast from only as far north as Vancouver Island have been found on the Islands. The station on the Charlottes is along the margin of Upper Victoria Lake about three miles from the west coast. The prevailing westerly winds in this region account for the submaritime climate and for the occurrence of other usually maritime species, for example, *Plantago macrocarpa* Cham. & Schlecht. and *Calamagrostis crassiglumis* Thurb.

218. Salix lasiandra Benth., Pl. Hartw. 335. 1857.

MORESBY ISLAND: Skidegate Lake, *CST21017, CST21951;* Mosquito Lake, *CST21021;* 2 mi S of Sandspit, *CT36089*.

In a treatment of the willows of boreal western North America Raup (1959, p. 41) recognizes three varieties of *S. lasiandra* in addition to the typical phase. Our collections from the Charlottes belong to var. *lancifolia* (Anderss.) Bebb, which has leaves that are pale green or somewhat glaucous beneath and young branchlets that are densely pubescent. According to Hultén (1943*a*, p. 504) this is the only phase that occurs in Alaska and Yukon. Raup has pointed out that *S. lasiandra* is highly variable as to the coloration and shape of the leaves and the degree of pubescence of the young branchlets.

Salix lasiandra is a rare species on the Queen Charlotte Islands found only along the margins of Skidegate and Mosquito lakes and near Sandspit on Moresby Island. Trees 4 to 5 m high are locally common along the shores of both lakes.

219. Salix reticulata L. ssp. **glabellicarpa** Argus, Can. J. Bot. 43: 1021. 1965. **Figures 117-121.**

GRAHAM ISLAND: Tan Mtn., *CST21621.*

MORESBY ISLAND: Takakia Lake, *CST23086, CT36347;* Mosquito Mtn., *CT23691, CT36479;* Tasu Sound, June 26, 1961, *Foster & Bigg* (UBC).

This endemic subspecies of *S. reticulata* from the Queen Charlotte Islands has recently been described by Argus (1965) on the basis of our 1957 and 1964 collections. It is distinguished from the typical phase by its glabrous ovaries and capsules. In his paper Argus discusses the relationship of ssp. *glabellicarpa* to the circumpolar ssp. *reticulata* and the American Cordilleran *S. nivalis* Hook. (=*S. reticulata* ssp. *nivalis* (Hook.) Anderss.).

Subspecies *glabellicarpa* was only found at high elevations in the central mass of the Queen Charlotte ranges, but it is undoubtedly more common throughout this region than indicated by the few collections cited. This prostrate trailing willow is usually found growing on cliff ledges or in cliff crevices above 2,400 ft.

220. Salix scouleriana Barratt in Hook., Fl. Bor.-Amer. 2: 145. 1838.
S. scouleriana f. *poikila* C. Schneider, J. Arnold Arb. 2: 12. 1920.

GRAHAM ISLAND: between Queen Charlotte City and Skidegate, *CST20926;* 2½ mi E of Masset, *CST21298, CT35605;* about 2½ mi S of Tlell, *CST21345, CTS34660;* west of Queen Charlotte City, *CST22469;* about 3 mi E of Tow Hill, *CST22743;* Masset, July 1901, *Newcombe* (V); Skidegate, May 31, 1923, *Newcombe* (V); 6 mi NW of Skidegate, May 27, 1951, *Cowan* (UBC); Tlell, June 2, 1951, *Cowan* (UBC).

MORESBY ISLAND: Copper Bay, *CST21903;* Bag Harbour, *CST-22186;* Limestone Island, *CST34815;* South Low Island, *CTS34852;* Tuft Islets, *CTS34869.*



Figures 117–121. *Salix reticulata* L. ssp. *glabellicarpa* Argus. 117. Habit (× ½). 118. Leaf, adaxial surface (× ½). 119. Leaf, abaxial surface (× ½). 120. Staminate flower (× 20). 121. Pistillate flower (× 20).

Dr. G. W. Argus, who examined all the willow collections made on the Charlottes in 1957, has commented on the variable leaf shape of this species in central and coastal Alaska. The same may be said for the entire population that occurs along the British Columbia coast, including a series of collections from Vancouver Island and the Queen Charlotte Islands. Schneider (1920, p. 6) has discussed in detail the typification and variation in *S. scouleriana,* taking into account the forms recognized by Henry (1915, p. 98) in the *Flora of Southern British Columbia.* Schneider formally recognized two phases, the typical and f. *poikila* C. Schneider, the latter having leaves that are conspicuously pubescent beneath. We have seen a number of collections of the pubescent-leaved phase, especially from Alaska and Yukon, but such plants merely represent one extreme of a species that has leaves varying from glabrous to densely pubescent beneath.

Salix scouleriana is an early-flowering species with catkins that are usually well developed before the leaves begin to open and expand. When we arrived in the Queen Charlotte Islands in late May of 1957, the staminate and pistillate catkins had already fallen. All the collections cited are represented by leafy sterile specimens. In the Charlottes *S. scouleriana* is common but scattered in many places along the north and east coasts of Graham and Moresby islands on open sea bluffs, in meadows, and in open coniferous forests at the shoreline. It is a shrub or small tree about 5 to 6 m high in favorable habitats, but stunted in exposed situations at the coast and in poorly drained marshy meadows.

221. Salix sitchensis Sanson in Bong., Mém. Acad. St. Pétersb. VI. 2: 162. 1832.

GRAHAM ISLAND: Mamin River Delta, *CT35538.*

MORESBY ISLAND: between Copper Bay and Skidegate Lake, *CT-35256;* Skidegate Lake, *CT35268;* White Swan Bog, *CT35294.*

This species is widely distributed along the Pacific slope of the Cordilleran region from south-central California to Kodiak Island in Alaska, and has been collected a number of times in the southern interior of British Columbia.

Salix sitchensis was only collected at four localities during our two summer surveys, but it is undoubtedly more widely distributed on the Islands than these records indicate. This species usually forms a narrow belt between coniferous woods and adjacent lake or creek margins. Some trees found along the banks of Copper Creek reached a height of over 6 m and had a DBH of 15 cm.

Myricaceae

Myrica

222. Myrica gale L., Sp. Pl. 2: 1024. 1753.

M. gale var. *tomentosa sensu* Hultén, as to B.C. and Alaska coast plants.

GRAHAM ISLAND: near Tow Hill, *CST21169, CST21334, CST22712,* Masset, Sept. 25, 1912, *Green* (UBC).

MORESBY ISLAND: Skidegate Lake, *CST21006, CT35147;* White Swan Bog, *CST21031;* Red Mud Marsh, *CST22063;* Upper Victoria Lake, *CT35742.*

There is considerable variation in leaf shape and the degree of leaf pubescence in *M. gale* throughout its range. Hultén (1944, p. 571; 1958, p. 218) considers that three minor races of this species occur in North America: (1) var. *gale,* which extends from the Atlantic coast westward to central Alaska, (2) var. *subglabra* (Chev.) Fern., which is restricted to eastern North America and has glabrous or essentially glabrous leaves, and (3) var. *tomentosa* C. DC., which occurs along the Pacific coast from Washington to Alaska. Hultén's statement that the leaves of all Pacific coast plants are more pubescent on both surfaces than those in eastern North America is incorrect. All 60 collections in our institute from coastal Alaska and British Columbia have plants with pubescent leaves, but in a number of the collections the leaves are less pubescent than in material from the eastern part of the continent. Hultén also states that plants from the Pacific coast have leaves that are blunter and wider closer to the apex than the "Atlantic plant." Statistically this may be true, but there are numerous exceptions when a large body of material is examined from both eastern and western North America. We are unable to reach a decision as to whether the epithet *tomentosa* should be applied to the Pacific coast plant of eastern Asia as we have seen only a few sheets from this region. However, there is no justification for recognizing the Pacific coast population of western North America as var. *tomentosa.*

Myrica gale occurs sporadically on the Queen Charlotte Islands and is restricted to lowland bogs and lake margins.

Betulaceae

Alnus

Leaves lustrous beneath, intercostal venation inconspicuously scalariform, margins flat; fruiting peduncles slender, usually longer than the cones ..... *A. crispa*

Leaves dull beneath, intercostal venation conspicuously scalariform, margins conspicuously revolute; fruiting peduncles stout, shorter than the cones ..... *A. rubra*

223. Alnus crispa (Ait.) Pursh ssp. **sinuata** (Regel) Hult., Fl. Alaska & Yukon 4: 587. 1944.

A. sinuata (Regel) Rydb., Bull. Torrey Club 24: 190. 1897.
A. sitchensis (Regel) Sarg., Silva 14: 61. *pl.* 727. 1902.

GRAHAM ISLAND: Empire Anchorage, *CS21440;* Langara Island, *CST22509,* May 21, 1952, *Beebe* (V); Dawson Inlet, *CST22831, CTS35136;*

Shields Bay, *CT23336;* Jalun Lake, *CT35623;* Yakoun Lake, *CT36780;* Juskatla, June 10, 1952, *Schmidt;* Skidegate, May 1901, Sept. 12, 1902 and May 22, 1923, *Newcombe* (V), May 27, 1951, *Cowan* (UBC); small island near Skidegate, July 19, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: Chaatl Narrows, *CST21783;* Bigsby Inlet, *CST-22118;* Takakia Lake, *CST23128;* Richardson Island, *CTS34916;* Anna Inlet, *CTS34960;* Upper Victoria Lake, *CT35789;* Kootenay Inlet, *CT36212;* Kaisun, *CT36547;* Yakulanas Bay, *CT36656;* Rose Inlet, *CT36984.*

There are diverse viewpoints as to how the group of alders that includes *A. crispa* (Ait.) Pursh, *A. sinuata* (Regel) Rydb., and *A. viridis* (Chaix) DC. should be treated. In a recent article Turrill (1961) discussed the relationships between the eastern North American and European populations of the *A. viridis* complex and stated that although there were statistical differences between them they could not be consistently separated on morphological characters. He concluded that the two populations belong to intergrading subspecies and designated the American shrub *A. viridis* ssp. *crispa* (Ait.) Turrill, in which he included Fernald's var. *mollis*. Unfortunately Turrill did not include the Pacific coast population in his discussion. Regel (1868, p. 183) in De Candolle's *Prodromus* considered the Pacific coast shrub to be a variety of the Old World *A. viridis*. Although almost all American authors have regarded the Pacific coast population as a distinct species or as a race of *A. crispa* it might be better to return to Regel's original concept. Only a detailed study of the entire complex will shed light on the relationships between the various taxa.

Alnus crispa ssp. *sinuata* of the Pacific Northwest coast is a shrub or small tree with large, thin, acute, and distinctly doubly serrate leaves that are shiny and essentially glabrous on the lower surface. This coastal subspecies can be readily distinguished from ssp. *crispa* of central and eastern Canada. Subspecies *crispa* is a shrub with smaller, thicker, and more abruptly acute serrulate leaves that are often dull beneath and pubescent at least on the midveins and nerves. Subspecies *sinuata* is essentially coastal in its distribution in the northern part of its range but to the south it extends inland to the eastern flank of the Rocky Mountains. In the region east of the Coast Mountains its leaves are not as conspicuously sinuous and doubly serrate. Intermediate forms occur in central Alaska, southern Yukon, northeastern British Columbia, and northwestern Alberta where ssp. *sinuata* meets the more eastern ssp. *crispa*.

On the Queen Charlotte Islands *A. crispa* is a shrub or small tree, which may reach a height of 7 m. It is common along the rock shorelines of many of the inlets and bays in the more humid coastal regions of Graham and Moresby islands and extends to subalpine meadows in the Queen Charlotte Ranges.

224. Alnus rubra Bong., Mém. Acad. St. Pétersb. VI. 2: 162. 1832, not Marsh.
A. oregona Nutt., Sylva 1: 28. 1842.

GRAHAM ISLAND: 2½ mi E of Masset, *CST21299;* Mercer Lake, *CS21498;* near Lawnhill, *CST21737;* Langara Island, *CST22553;* near Masset

Spit, *CST22642;* Long Inlet, *CT35965;* Yakoun Lake, *CT36768;* Skidegate, June 1901, *Newcombe* (V).

MORESBY ISLAND: Mosquito Lake, *CST21019, CT23660;* near Alliford Bay, *CST21058;* Sandspit, *CST21093;* near Gray Bay, *CST23443;* below Mt. de la Touche, *CT23560;* Bigsby Inlet, *CTS34896;* Crescent Inlet, *CTS-34978.*

Alnus rubra is a common tree along the upper limits of sea beaches, on river flats, and on lake margins, especially in the lowlands of eastern Graham and Moresby islands. It reaches maximum development on river flood plains, where it often forms almost pure stands and individual trees may reach a height of about 22 m. It is essentially a species of the costal lowlands, but on mainland British Columbia it extends inland along the major river courses.

Moraceae

Humulus

225. *Humulus lupulus L., Sp. Pl. 2: 1028. 1753.

GRAHAM ISLAND: Queen Charlotte City, *CT36979.*

This species was only found on a steep roadside bank in front of the Haida Hotel at Queen Charlotte City. It was noted in nearby gardens.

Urticaceae

Urtica

226. *Urtica dioica L., Sp. Pl. 2: 984. 1753.

GRAHAM ISLAND: Queen Charlotte City, *CST23006;* Tow Hill, *CTS-34763;* Lawn Pt., *CT35439;* Long Inlet, *CT35972.*

MORESBY ISLAND: East Copper Island, *CTS22254;* Sandspit, *CT-36024;* Kaisun, *CT36561;* Kitgoro Inlet, June 30, 1897, *Newcombe* (CAN).

The taxonomic relationships within the *U. dioica* complex are not clearly understood. Hermann (1946) discussed this complex in eastern North America and concluded that all entities belong to two subspecies of *U. dioica.* This decision, which was based on both field and garden studies, showed that those entities described as distinct species by some authors are only part of the normal variation within *U. dioica.*

Hultén (1944, p. 592) states that *U. gracilis* Ait. and *U. lyallii* S. Wats. are very closely related species and represent clear geographical races of *U. dioica;* but he maintains the two races as distinct species. We have examined material from Alaska, Yukon, and British Columbia, but we are not able to distinguish the two entities on the basis of his key.

Selander (1947) in his discussion of *U. gracilis* in Fennoscandia states that *U. dioica* var. *sondenii* Simm. of Europe is closely related to or perhaps identical with *U. gracilis* of North America and recognizes but a single species in this complex, *U. dioica* with two subspecies. The Pacific Northwest *U. dioica* complex and the relationship of *U. lyallii* to *U. dioica* are not fully understood by Selander. The recent treatment by Hitchcock (*in* Hitchcock *et al.,* 1964) provides little clarification of the relationships within this complex for the Pacific coast region, but merely adds to the already voluminous nomenclature of *U. dioica.*

We consider that the Pacific Northwest material of British Columbia and adjacent Alaska belongs to *U. dioica* in the broad sense, fully realizing that geographical segregates may exist in this polymorphic complex. We concur with both Selander and Hermann that the North American segregates should not be given specific rank, and we believe the formal recognition of these subspecies must await a detailed biosystematic study of both Old and New World populations.

Urtica dioica is not widely distributed on the Queen Charlotte Islands and all collections were made at abandoned or presently occupied settlements. Populations were noted at Kaisun and Dadens, both ancient Indian villages. At both these localities *Urtica* was quite abundant and formed a conspicuous element of the local vegetation.

Loranthaceae

Arceuthobium

227. Arceuthobium campylopodum Engelm. in A. Gray, Bost. J. Nat. Hist. 6: 214. 1850.

A. douglasii var. *tsugensis* (Rosend.) M. E. Jones, Bull. Univ. Mont. Biol. 15: 25. 1910.

GRAHAM ISLAND: Langara Island, *CST22564;* Tow Hill, *CST22739;* Queen Charlotte City, *CST23011.*

MORESBY ISLAND: between Gray and Sheldens bays, *CST23441.*

This wide-ranging parasite of conifers in the western United States and Canada has been recorded on *Abies, Larix, Picea, Pinus,* and *Tsuga;* but only *Tsuga heterophylla* (Raf.) Sarg. was found to be parasitized by this *Arceuthobium* on the Queen Charlotte Islands. Hultén (1944, p. 593) and Henry (1915, p. 116) refer the parastic mistletoe on *Tsuga* of the coast regions to *A. douglasii* Engelm., but Gill (1935, p. 170) in his extensive study of the genus states that *A. douglasii* is restricted to *Pseudotsuga* and *Abies* and does not occur west of the Cascade Mountains in the Pacific Northwest. We are referring our material to *A. campylopodum* and do not recognize f. *tsugensis* Gill as there seems little justification for recognition of taxonomic entities based entirely on host specificity. This subject has been discussed by Kuijt (1960, p. 337) in his morphological study of the genus.

Arceuthobium campylopodum is quite common on the Charlottes and the few stations recorded do not indicate how frequently it occurs on *T. heterophylla.*

Polygonaceae

Leaves reniform; achenes lenticular, surrounded by a single, large, flat wing ..... *Oxyria*
Leaves never reniform; achenes 3-angled or if lenticular never surrounded by a single flat wing
  Inflorescence unbranched except in *P. polystachyum;* perianth segments petaloid, not enlarged in fruit, achenes lenticular or 3-angled ..... *Polygonum*
  Inflorescence usually branched; perianth segments not petaloid, the inner enlarged in fruit or, if not, the plants dioecious; achenes 3-angled ..... *Rumex*

Oxyria

228. Oxyria digyna (L.) Hill, Hort. Kew. 158. 1768.

GRAHAM ISLAND: Shields Bay, *CT23346;* Long Inlet, *CT35957.*

MORESBY ISLAND: Takakia Lake, *CST23099;* Mt. de la Touche, *CT23537;* Mosquito Mtn., *CT23703;* Mt. Russ, *CT36141;* Mt. Moresby, *CT36388.*

Oxyria digyna is a common and widespread alpine element throughout the Cordilleran region of North America. On the Queen Charlotte Islands it is restricted to the mountains and is particularly common in rocky runnels and on moist talus slopes from near sea level along the exposed west coast to well above tree line in the central mountain mass.

Polygonum

Inflorescences dense, spikelike
  Stems unbranched from a thickened farinaceous caudex; inflorescence terminal; alpine or subalpine . *P. viviparum*
  Stems branched from a well-developed taproot; lowland
    Calyx green; ochreae flaring at apex, glabrous with inconspicuously ciliate margins; leaf tips blunt *P. scabrum*
    Calyx pink; ochreae not flaring at apex, pubescent with conspicuously ciliate margins; leaf tips acute ..... *P. persicaria*
Inflorescences not dense, in few-flowered racemes
  Plants up to 2 m high, somewhat shrubby; leaves up to 25 cm long; flowers white, conspicuous ..... *P. polystachyum*

Plants usually prostrate to spreading, upright or twining, never shrubby; leaves less than 10 cm long; flowers green or slightly pink, inconspicuous
Stems twining; leaves cordate; achenes black, 3-4 mm long ..... *P. convolvulus*
Stems spreading prostrate or upright, never twining; leaves ovate or elliptic to oblanceolate, never cordate; achenes brown or olivaceous, always less than 3 mm long
Leaves ovate to oblanceolate, up to 3 cm long, 1.5 cm wide; achenes lustrous brown, not conspicuously roughened, prominently 3-angled at apex; plants usually upright ..... *P. fowleri*
Leaves elliptic to lanceolate, up to 3 cm long, but never more than 0.8 cm wide; achenes dull olivaceous, striate or granular roughened, not prominently 3-angled at apex; plants usually spreading prostrate ..... *P. aviculare*

229. *Polygonum aviculare L., Sp. Pl. 1: 362. 1753.

GRAHAM ISLAND: Queen Charlotte City, *CST22478, CST23019;* Masset Spit, *CST22792;* Tlell, *CT35915;* Haida Pt., *CT36682;* Delkatla Inlet, *CT36916.*

MORESBY ISLAND: Alliford Bay, *CST23235;* Sandspit, *CT36019.*

Polygonum aviculare is one of the most widely introduced knotweeds in Canada and is a particularly ubiquitous yard and roadside weed in settlements. Many segregates have been proposed on the basis of general habit and ecological preference and some should probably be considered as ecophenes. The taxonomy of *P. aviculare* is further complicated by the possible occurrence of indigenous taxa. A single collection from the shingle beach on Masset Spit may represent a native; but general branching habit, ochrea, flower morphology, achene size, color, and shape are consistent with those characters found in the obviously introduced plants collected from the townsites of Queen Charlotte City and Alliford Bay. The taxonomic disposition of possibly indigenous members must await detailed study of European, Asian, and North American populations and until such a study is completed we are including all entities of this complex in *P. aviculare.*

230. *Polygonum convolvulus L., Sp. Pl. 1: 364. 1753.

GRAHAM ISLAND: Queen Charlotte City, *CT36974.*

MORESBY ISLAND: Sandspit, *CST23220, CT36011, CT37013.*

Polygonum convolvulus was found along roadsides, in a gravel pit, and

in other disturbed habitats in the vicinity of Sandspit. The only other collection from the Islands is from Queen Charlotte City, where a single plant was collected in a shoreline meadow near the British Columbia Forestry Station.

231. Polygonum fowleri B. L. Robinson, Rhodora 4: 67. 1902.

GRAHAM ISLAND: west of Queen Charlotte City, *CST22482;* Masset Spit, *CST22780, CT35705;* Queen Charlotte City, *CST23034;* Jungle Beach, *CST23395;* Long Inlet, *CT36006.*

MORESBY ISLAND: Copper Bay, *CST21878;* head of Cumshewa Inlet, *CST23650;* mouth of Deena River, *CT23798.*

Polygonum fowleri was thought by Fernald (1950, p. 577, 578) to occur only along the coast of eastern North America, but most authors including Hultén (1944, p. 617, 618), Abrams (1944, p. 56), and Munz (1959, p. 361, 362) record this species from both the Atlantic and Pacific coasts. After examination of our coastal material of *Polygonum* from the Queen Charlotte Islands and elsewhere along the Pacific coast we have arrived at the same conclusions as the last three authors.

As in many species of *Polygonum,* variation in leaf outline, size and number of flowers in a raceme, and general habit make taxonomic decisions difficult. The Queen Charlotte Islands material does not have the achenes as prominently exserted from the calyx as populations from farther north along the Alaskan coast, however achene size and morphology are nearly identical in all Pacific coast populations and although variation in leaf morphology exists, even in plants from the same populations, we have little hesitation in referring our collections to *P. fowleri.* Most records from the Charlottes are from the vicinity of Skidegate Inlet, but it occurs throughout the Islands except on exposed rocky shorelines, which are subjected to continual pounding by the surf.

232. *Polygonum persicaria L., Sp. Pl. 1: 361. 1753.

GRAHAM ISLAND: Queen Charlotte City, *CST23028, CST23804;* Jungle Beach, *CST23390;* about 6 mi N of Skidegate Village, *CT23683;* 2½ mi S of Tlell, *CT36877;* Delkatla Inlet, *CT36918.*

The six records of *P. persicaria* are from the settled areas of eastern Graham Island. It was collected in a number of disturbed habitats along the road between Queen Charlotte City and Tlell and a few plants were found along the upper limits of the beach at the causeway near the west end of Delkatla Slough at Masset.

233. *Polygonum polystachyum Wall., Cat. No. 1686. 1829.

GRAHAM ISLAND: between Queen Charlotte City and Skidegate Village, *CT36947.*

Polygonum polystachyum, a native of Asia, is occasionally grown as an ornamental in gardens in the coastal regions of British Columbia and the western United States. It is a strongly rhizomatous species, which occasionally escapes from cultivation and completely crowds out all other vegetation. It is a common escape in Skidegate Village, and a particularly aggressive colony was noted in the nearby Haida cemetery.

234. *Polygonum scabrum Moench, Meth. 629. 1794.
P. lapathifolium L., Sp. Pl. 1: 360. 1753, in part.

MORESBY ISLAND: Sandspit, *CST23218, CT37004.*

Plants of this species have usually been placed under the name *P. lapathifolium* L.; however, as Fernald (1921, p. 258, 259) pointed out in a discussion on *P. lapathifolium* and *P. scabrum,* the retention of the latter name seems justified. We are accepting this name for plants from the Queen Charlotte Islands that have green perianth segments, upright inflorescences, and orbicular or broadly ovate achenes with concave sides about 3 mm long and about 2.5 mm broad. *Polygonum lapathifolium* differs from *P. scabrum* in having pink perianth segments, arching or somewhat drooping inflorescences and smaller achenes about 2 mm long and 1.8 mm broad. Recent floras, for example, *Flora Europaea* and *Vascular Plants of the Pacific Northwest,* do not recognize *P. scabrum* but include this species in the synonymy of *P. lapathifolium.*

This species is apparently restricted to light sandy or gravelly disturbed soils in the Sandspit area. A large colony was noted near the Islander Motel on the west side of the town site.

235. Polygonum viviparum L., Sp. Pl. 1: 360. 1753.

GRAHAM ISLAND: Tan Mtn., *CST21579.*

MORESBY ISLAND: Takakia Lake, *CST23082, CT36326;* Mosquito Mtn., *CT23762, CT36478.*

Polygonum viviparum is one of the most common and widely distributed alpine species in the northern Cordilleran region of western North America, but is rare on the Queen Charlotte Islands. It was noted only in three areas in the Queen Charlotte Ranges, where it occurs in small localized colonies on alpine and subalpine heath slopes.

Rumex

Plants usually dioecious, sometimes polygamous; flowers never perfect; leaves hastate ..... *R. acetosella*
Plants monoecious; flowers always perfect; leaves never hastate
Stems erect, procumbent, or ascending, branched below inflorescence; callous grains usually on 3

segments and occupying nearly whole breadth of valve ..... *R. transitorius*
Stems erect, not branched below inflorescence; callous grains present or absent, if present never occupying nearly whole breadth of valve
Valves without callous grains; pedicels not conspicuously jointed ..... *R. occidentalis*
Valves with callous grains; pedicels conspicuously jointed
Valve margins essentially entire; lower leaves gradually narrowed to base ..... *R. crispus*
Valve margins denticulate; lower leaves cordate at base ..... *R. obtusifolius*

236. *Rumex acetosella L., Sp. Pl. 1: 338. 1753.
R. angiocarpus Murb., Lunds Univ. Årsskr. 27: 46. 1891; *R. acetosella* ssp. *angiocarpus* Murb., Bot. Not. 41. 1899.

GRAHAM ISLAND: Queen Charlotte City, *CST22845;* Tlell, *CST-23159, CTS34634;* 1 mi W of Queen Charlotte City, *CTS34793;* Yakoun River 4½ mi S of Port Clements, *CT35040;* Skidegate, June 1901, *Newcombe* (V).

MORESBY ISLAND: Copper Bay, *Foster & Joslin 13, 15;* Kaisun, July 14, 1897, *Newcombe* (CAN).

The taxonomic disposition of the many subspecies of *R. acetosella* has been the subject of several investigations. We are following Clapham *et al.* (1962, p. 553) in their treatment of the British flora in recognizing *R. acetosella* as an aggregate species consisting of a number of poorly understood subspecies. We are including *R. angiocarpus* in synonymy as plants from British Columbia have the perianth parts adnate to the fruit (*R. angiocarpus*), but the chromosome number is 2n=42 (*R. acetosella*). Clearly the morphological variation has not been carefully correlated with cytological information.

Rumex acetosella was observed in many disturbed habitats near the few settlements on the Islands. It is particularly common in the public school grounds at Queen Charlotte City and it is one of the most common weeds in the village of Masset.

237. *Rumex crispus L., Sp. Pl. 1: 335. 1753.

GRAHAM ISLAND: west of Queen Charlotte City, *CST22484, CT-36938;* Masset Spit, *CST22785;* Jungle Beach, *CST23391, CT35449;* about 2½ mi S of Jungle Beach, *CT36695.*

MORESBY ISLAND: Harriet Harbour, *CST22267;* Sandspit, *CT35333;* Alliford Bay, *CT36483.*

Rumex crispus is a native European species that has become widely distributed in both the Old and New World. All specimens from the Queen Charlotte Islands were collected along the east coasts of Graham and Moresby islands. It is particularly common in the stabilized driftwood zone, but is also found in adjacent saline sedge meadows and was noted a number of times in disturbed habitats along roadsides in the vicinity of the coast.

238. *Rumex obtusifolius L., Sp. Pl. 1: 335. 1753.

GRAHAM ISLAND: west of Queen Charlotte City, *CST22477;* Queen Charlotte City, *CST23025, CT36969;* between Skidegate and Skidegate Village, *CT35840;* Skidegate, June 1901, *Newcombe* (V).

MORESBY ISLAND: Sandspit, *CT35355.*

This European species has been widely introduced into North America, and most of our introductions, including those from the Islands, can be referred to ssp. *agrestis* (Fr.) Danser. Rechinger (1937, p. 127) states that one other European subspecies occurs in North America.

All collections from the Queen Charlotte Islands were made in the inhabited regions around the eastern end of Skidegate Inlet. This species tolerates a large number of environmental niches, but occurs more frequently on disturbed roadsides in and around town sites than in any other habitat.

239. Rumex occidentalis S. Wats., Proc. Amer. Acad. 12: 253. 1877.
R. fenestratus Greene, Pittonia 4: 306. 1901.

GRAHAM ISLAND: Tlell, *CST23167;* Juskatla, *S3513;* Delkatla Inlet, *CT36830;* mouth of Honna River, *CT36925;* Queen Charlotte City, *CT36942.*

MORESBY ISLAND: Anna Inlet, *CTS34926;* 1 mi W of Skidegate Lake, *CT36738;* Copper Creek, *Foster & Joslin 73* (UBC).

Rumex occidentalis is a wide-ranging species that occurs throughout the temperate region of the United States and Canada. A large-fruited form with valves averaging 9 mm in length is found along the Pacific coast from middle California to Alaska. Isolated populations of this robust form occur in Labrador and on the north shore of the Gulf of St. Lawrence. This coastal phase was described by Greene as *R. fenestratus* on the basis of a collection from Vancouver Island. Rechinger (1937, p. 114) recognized the Greene species as a separate and distinct entity from *R. occidentalis* on differences of size of fruiting perigonia and nutlets. We have examined a large series of specimens from western Canada and find it very difficult to segregate two species from this polymorphic complex as the size and form of leaves, leaf margins, and outline of the valves are quite variable and of little use as diagnostic characters. Thus we recognize the morphological variation described for these two species as that of a single taxon.

Rumex occidentalis is essentially a coastal species on the Islands, but two collections are from inland sites, that is, near Juskatla and near Skidegate Lake. Two collections, *S3513* and *CT36830,* have pubescence along the veins on the abaxial surfaces of the leaves. In collection *S3513* the margins of the valves are somewhat erose. These two collections may indicate evidence of introgression of the introduced *R. obtusifolius* L. with the native *R. occidentalis.* Garden studies and cytological information are needed to test these hypotheses.

240. Rumex transitorius Rech. f., Repert. Sp. Nov. 40: 296. 1936.

R. mexicanus sensu Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 34. 1921.

R. salicifolius ssp. *salicifolius sensu* C. L. Hitchc., Vasc. Pl. Pacif. NW. 2: 179. 1964, at least as to British Columbia plants.

GRAHAM ISLAND: Masset Spit, *CST22796;* Jungle Beach, *CST23398;* near mouth of Sangan River, *CT35600;* about 4 mi N of mouth of Oeanda River, *CT35849.*

MORESBY ISLAND: Hotspring Island, *CST22276;* near Alliford Bay, *CST23230;* head of Cumshewa Inlet, *CT23648, CT36490;* between Moresby and Aero Logging Camps, *CT35283;* Sandspit, *CT35332;* Horn Rock, *CT-36520;* Yakulanas Bay, *CT36655;* Tasu Sound, Aug. 10, 1957, *Mills;* June 1901, *Newcombe* (V).

Rumex transitorius occurs along the northwest Pacific coast from central California to the base of the Aleutian Island chain in Alaska. In recognizing this distributional pattern, we are following the taxonomic treatment of Rechinger (1937). He uses the epithet *transitorius* for all Pacific *salicifolius*-like forms in which all three fruiting perianth segments possess large callous grains that almost cover the segments.

Rumex transitorius occurs on both the western and eastern coasts of the Islands. It is usually found on the upper parts of shingle beaches or along rocky shorelines. It is frequently a conspicuous element of plant communities inhabitating the stabilized driftwood zone along the east coast. Mature specimens were not collected until August.

Chenopodiaceae

Leaves succulent, semicylindric and less than 5 mm wide, or reduced to minute scales
- Stems jointed; leaves opposite and reduced to minute scales ..... *Salicornia*
- Stems not jointed; leaves alternate, linear and semicylindric ..... *Suaeda*

Leaves not succulent, flat, largest more than 5 mm wide
- Fruits enclosed by a pair of conspicuous rhomboidal or broadly ovate bracts ..... *Atriplex*
- Fruits closely surrounded by the persistent sepals, bracts never enclosing fruit ..... *Chenopodium*

Atriplex

241. Atriplex patula L. ssp. **obtusa** (Cham.) Hall & Clements, Carnegie Inst. Publ. 326: 252. *fig.* 31, a-e. 1923.

A. gmelini C. A. Meyer, Mém. Acad. St. Pétersb. VI. 2: 160. 1832.
A. hastata sensu Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 34. 1921.
A. patula var. *obtusa* (Cham.) Peck, Madroño 6: 133. 1941.

GRAHAM ISLAND: Masset Spit, *CST22794;* Dawson Inlet, *CST22847;* Queen Charlotte City, *CST23035;* Tlell, *CST23166;* between Queen Charlotte City and Skidegate, *CST23258;* Jungle Beach, *CST23394;* Naden Harbour, *CT36868;* Skidegate, June 1897, *Newcombe* (V); Skidegate Inlet, July 4, 1897, *Newcombe* (CAN).

MORESBY ISLAND: Harriet Harbour, *CST22268;* Gray Bay, *CST-23427, CT35254;* Copper Bay, *CT23643;* head of Cumshewa Inlet, *CT23646;* mouth of Deena River, *CT23764, CT23780;* Sandspit, *CT35334, CT37005;* Kootenay Inlet, *CT36211;* Little Goose Bay, Sept. 10, 1951, *Pillsbury* (UBC).

In a monograph of the genus *Atriplex* for North America, Hall and Clements (1923) considered that all material from along the northern British Columbia and Alaska coast belonged to the *A. patula* complex. They recognized three taxa in this area: ssp. *obtusa* Hall & Clements, ssp. *alaskensis* (S. Wats.) Hall & Clements, and ssp. *zosteraefolia* (Hook.) Hall & Clements. Hultén in *Flora of Alaska and Yukon* also recognized three taxa in this region: *A. gmelini* (= ssp. *obtusa*), *A. alaskensis* S. Wats. (= ssp. *alaskensis*), and *A. drymarioides* Standley. Hall and Clements considered that *A. drymarioides* represents merely a depauperate phase of ssp. *obtusa*. The exact relationship between the members of the *A. patula* complex along the northwest Pacific coast is still obscure, but they are obviously closely related. In general we are following the treatment of Hall and Clements as we feel it is the more realistic, both on morphological and phytogeographical grounds.

The Queen Charlotte Island material has petiolate, linear to lanceolate leaves, the largest sometimes being subhastate. The margins are either entire or sparsely and inconspicuously toothed. The fruiting bracts are rhomboidal or broadly ovate, entire-margined or with a few teeth towards the base, smooth-faced or slightly tuberculate. Although there is considerable variation in the material, we are referring all collections from the Islands to ssp. *obtusa*. The plants are quite unlike the few collections we have seen of ssp. *alaskensis*, which have prominent fruiting bracts that are oblong to ovate-orbicular, up to 2 cm in length, entire-margined, smooth-faced, and thickened at the base. They also differ from ssp. *zosteraefolia*, which has linear leaves and bracts. This latter subspecies was erroneously reported from Prince of Wales Island, Alaska by Hall and Clements. It is apparently restricted to the region bordering Juan de Fuca Strait between the Olympic Peninsula of Washington and southern Vancouver Island.

Subspecies *obtusa* is common in saline or brackish tidal meadows and on gravel or silty shorelines along the coast. On open gravel beaches, where there is little competition, plants are usually short with widely spreading assurgent branches and the fruiting bracts are small. In contrast, plants from tidal meadows are taller, larger leaved, less compact, with the branches more strongly ascending, and many of the fruiting bracts are larger. Hall and Clements described ssp. *obtusa* as having fruiting bracts 4 to 20 mm long, but in plants from the Queen Charlotte Islands they range from 2 to 10 mm (average about 4 mm) in length.

The diversity of habitats in which ssp. *obtusa* grows is probably in part responsible for the marked morphological differences between populations. In an open sea coast environment where relatively rapid migration and colonization takes place one might expect to find a number of phenotypes. Only a detailed cytogenetic study of the various segregates may reveal to what extent the response is genetic or ecological.

Chenopodium

242. *Chenopodium album L., Sp. Pl. 1: 219. 1753.

MORESBY ISLAND: Sandspit, *CST23216, CT35335, CT37003.*

The disposition of taxa within the *C. album* complex and the segregates of *C. album* itself have been the subject of several reports. Wahl (1954) has discussed previous works and recognizes three varieties in this species. Most plants from the Queen Charlotte Islands can be referred to var. *lanceolatum* (Muhl.) Coss. & Germ., but, as the taxonomic relationships of the members of this complex are still not well understood, we are tentatively recognizing the material from the Islands as *C. album* in the broad sense.

Chenopodium album was found only along the upper limits of the sand–shingle beaches around the airport at Sandspit and along the road to Copper Bay on the outskirts of the town site.

Salicornia

243. Salicornia pacifica Standley, N. Amer. Fl. 21: 83. 1916.
S. ambigua sensu Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 34. 1921.
S. virginica sensu western Amer. auth.

GRAHAM ISLAND: Masset Spit, *CST21248, CST22637, CST22798, CT35699;* Tlell, *CST21371, CT35939,* July 24, 1925, *W. A. Newcombe* (V); Queen Charlotte City, *CST22432;* 1 mi W of Queen Charlotte City, *CT35422;* Naden Harbour, *CT36869;* Long Inlet, July 26, 1897, *Newcombe* (CAN, V).

MORESBY ISLAND: Chaatl Narrows, *CST21785,* Copper Bay, *CST-21873;* head of Cumshewa Inlet, *CST21991;* Little Goose Bay, Sept. 10, 1951, *Pillsbury* (UBC).

The taxonomic relationship between the east- and west-coast perennials of *Salicornia* in North America is not clear. We are tentatively following Standley (1916), Hultén (1944, p. 632) and Mason (1957) in recognizing the Pacific coast plant as *S. pacifica,* but we believe that before any concrete taxonomic decisions can be made it will be necessary to look at this genus from a world-wide point of view. The application of *S. virginica* L. to North American west coast populations seems questionable as Linnaeus described this species as an annual, not a perennial.

On the Queen Charlotte Islands *S. pacifica* is a common coastal perennial of tidal flats, protected pools, and gravel flats behind the tidal zone, where occasional flooding from high tides may occur. It is absent from coastal habitats where there is strong wave action and heavy surf. *Salicornia pacifica* in the Charlottes is near the northern limit of its range with only two localities reported by Hultén from the adjacent Alaska panhandle.

Suaeda

244. Suaeda depressa (Pursh) S. Wats., Bot. King's Expl. 5: 294. 1871.

GRAHAM ISLAND: Masset Spit, *CST22797;* Lina Island, *CST22941;* Tlell, *CST23176, CT35938;* 1 mi W of Queen Charlotte City, *CT35421;* Naden Harbour, *CT36870;* Masset, *CT36919.*

In western Canada the genus *Suaeda* is widely distributed, but of sporadic occurrence both at the coast and in the interior in saline and alkaline habitats respectively. In British Columbia it has been infrequently collected north of Vancouver Island and there are only scattered records from the interior of the province. The interior material has been recognized as either *S. depressa,* a species described from the central plains of North America, or as *S. maritima* (L.) Dumort, a cosmopolitan species described from Europe. The coastal population has been recognized as *S. maritima* by most authors. Hultén (1944, p. 633) considered the Pacific coast plant to be *S. maritima* on the basis of three coastal collections. Porsild (1951, p. 160) referred a single collection from southern Yukon to this species, and Hitchcock (*in* Hitchcock *et al.,* 1964, p. 214) recognized an interior species *S. depressa* and a coastal one *S. maritima.*

We have examined and compared collections of the *S. maritima – S. depressa* complex from western Canada with material from the eastern part of the continent and Europe. The western prairie and Pacific plants tend to have small seeds ranging from 1.0 to 1.3 mm long, whereas the eastern Canadian and European populations have seeds approximately 1.5 to 2.2 mm long. The flowers of the western plants tend to be smaller and have more prominently corniculate perianth lobes. We are assuming that the European and eastern Canadian coastal plants are correctly identified as *S. maritima* and on this basis we are tentatively referring both inland and coastal British Columbia plants to the western species *S. depressa.* The relationship and disposition of the North American segregates of *Suaeda* must await a detailed monographic study of its world-wide members.

Suaeda depressa is locally common above the *Salicornia–Fucus* zone at the Masset Spit, on a shingle beach on Lina Island in Skidegate Inlet, at Naden Harbour, and on a shale beach near Queen Charlotte City. A few colonies were found on the silty tidal flats near the mouth of the Tlell River. This species is probably restricted to protected beach sites along the eastern and northern coasts of Moresby and Graham islands.

Nyctaginaceae

Abronia

245. Abronia latifolia Eschsch., Mém. Acad. St. Pétersb. V. 10: 281. 1826. **Figure 51.**

GRAHAM ISLAND: Tlell, *CST23173, CT35428.*

Abronia latifolia is one of the rarest coastal species on the Charlottes. In the 1957 survey it was collected in flower on the beach at Tlell where a single small colony of plants was found growing in stabilized sand behind the *Elymus mollis* zone. When this area was revisited in 1964 a number of nonflowering colonies were noted in the same habitat growing in association with such beach species as *Carex macrocephala* Willd., *Glehnia littoralis* ssp. *leiocarpa* (Mathias) Hult., *Convolvulus soldanella* L., *Poa douglasii* ssp. *macrantha* (Vasey) Keck and *Lathyrus littoralis* (Nutt.) Endl. Mr. P. P. Henson, former Indian Affairs Agent at Masset, reports (pers. comm.) that he observed a single nonflowering colony at Tlell in 1959. The only other record is a report by Carter and Newcombe (1921) who stated that it is common on the beaches at Masset. This report is probably based on a sight record because there is no collection of this species from the Charlottes in the Newcombe collection that was recently acquired by the British Columbia Provincial Museum. We have surveyed the sand beaches from Masset to Rose Spit and there are many suitable habitats for this species along this stretch of the coast. *Abronia latifolia* is at the northern limit of its range in the Queen Charlotte Islands.

Portulacaceae

Montia

Cauline leaves alternate; stoloniferous branches often present; bulbils frequently produced on flowering stalks and stolons ..... *M. parvifolia*

Cauline leaves opposite; stoloniferous branches absent; bulbils never produced on flowering stalks

Plants perennial, scapose; petals 6-10 mm long; seeds 1.5-1.8 mm long ..... *M. sibirica*

Plants annual, scapeless; petals less than 2 mm long; seeds 0.8-1.0 mm long ..... *M. fontana*

246. Montia fontana L., Sp. Pl. 1: 87. 1753.
M. lamprosperma Cham., Linnaea 6: 565. 1831.

GRAHAM ISLAND: Yakan Pt., *CST21308;* Empire Anchorage, *CS-21453;* near mouth of Oeanda River, *CT35907.*

MORESBY ISLAND: south of Sandspit on road to Copper Bay, *CST-20970.*

The Queen Charlotte Island material of this species was examined and identified by Dr. O. Nilsson of the Botanical Museum in Lund, Sweden. He pointed out that *M. fontana* has the only circumpolar distribution in the complex of species to which it belongs.

All collections from the Islands were made near the coast. This species frequently occurs in small soil-filled pockets on rocky headlands along the upper parts of beaches. Abundant seed was produced in all populations observed.

247. Montia parvifolia (Moc.) Greene, Fl. Fran. 181. 1891.
Claytonia parvifolia Moc. in DC., Prodr. 3: 361. 1828; *Naiocrene parvifolia* (Moc.) Rydb., Bull. Torrey Club 33: 139. 1906.
C. flagellaris Bong., Mém. Acad. St. Pétersb. VI. 2: 137. 1832; *M. flagellaris* (Bong.) Robins., Syn. Fl. N. Amer. 1: 276. 1897; *N. flagellaris* (Bong.) A. Heller, Muhlenbergia 3: 147. 1908; *M. parvifolia* ssp. *flagellaris* (Bong.) Ferris in Abrams, Ill. Fl. Pacif. States 2: 124. 1944; *M. parvifolia* var. *flagellaris* (Bong.) C. L. Hitchc., Vasc. Pl. Pacif. NW. 2: 242. 1964.

GRAHAM ISLAND: McClinton Bay, *CST21663;* Skidegate, *CST-22453;* 1 mi W of Queen Charlotte City, *CTS34794;* Towustasin Hill, *CT-35532;* Long Inlet, *CT35964;* 4 mi S of Juskatla, *S3528;* Dawson Harbour, June 24, 1897, *Newcombe* (CAN).

MORESBY ISLAND: near Alliford Bay, *CST21825;* Bigsby Inlet, *CST-22133;* Bag Harbour, *CST22191;* Echo Harbour, *CST22327;* Takakia Lake, *CST23144;* Mt. de la Touche, *CT23612;* Mosquito Mtn., *CT23742;* between Cumshewa and Peel inlets, *CT35175;* Mt. Moresby, *CT36393.*

The generic status of *M. parvifolia* has been the subject of several taxonomic reviews, Dr. J. R. Swanson of San Fernando Valley State College has been conducting a biosystematic study of the western North American members of the *Montioideae* and has concluded that *M. parvifolia* should be referred to the genus *Naiocrene,* a monotypic genus described by Rydberg (1906, p. 139). Dr. Swanson has stated (pers. comm.) that "the point of view I have taken with respect to genera is extreme." We are tentatively referring this species to the genus *Montia,* but the eventual generic disposition of this taxon must await the publication of his complete study.

Montia parvifolia shows considerable variation in shape and texture of leaves, and plants may reproduce either asexually by bulbils or sexually, the mode depending upon the environmental conditions. Careful examination of

material from the Cordilleran region of Alaska, British Columbia and adjacent northwestern United States reveals that plants with broadly ovate leaves seldom reproduce sexually and usually occur in shaded moist conditions throughout the range of the species. These plants have been recognized as a distinct species *M. flagellaris* or as infraspecific segregates of *M. parvifolia*. There appears to be no phytogeographic basis for the recognition of this entity. We suggest that *M. flagellaris* merely represents an extreme ecological form of the variable *M. parvifolia,* and that it should not be accorded formal taxonomic rank.

This species is widely distributed throughout the Islands and occurs in both lowland and alpine habitats. Many colonies had no flowering specimens and were reproducing only by bulbils.

248. Montia sibirica (L.) Howell, Erythea 1: 39. 1893. **Figure 122.**

Claytonia alsinoides Sims, Bot. Mag. 32: 1309. 1810; *M. alsinoides* (Sims) Pax & O. Hoffm. in E. & P., Nat. Pfl. 16C: 259. 1934.

C. asarifolia Bong., Mém. Acad. St. Pétersb. VI. 2. 137. 1832; *M. asarifolia* (Bong.) Howell, Erythea 1: 39. 1893.

GRAHAM ISLAND: 10½ mi S of Tlell, *CST20884;* Queen Charlotte City, *CST20909A, CST21542;* Tow Hill, *CST21196, CTS34753;* Empire Anchorage, *CS21449;* Mercer Lake, *CS21492;* Yakoun River Delta, *CST-21548;* McClinton Bay, *CST21663A;* Langara Island, *CST22562,* June 1, 1952, *Guiget* (V); 10 mi SSE of Juskatla, *T18;* about 3 mi N of Port Clements, *T142;* Tlell, *CTS34656;* 1 mi W of Queen Charlotte City, *CTS34795;* Naden Harbour, *CT36844;* Mamin River, May 30, 1952, *Schmidt;* MacIntosh Meadows, Aug. 23, 1961, *Foster & Bigg* (UBC); Honna River Trail, July 5, 1952, *Pillsbury* (UBC); Marble Island, June 16, 1961, *Foster & Bigg* (UBC); Yakoun Lake, Aug. 1895, *Newcombe* (V); Masset, Sept. 8, 1902, *Newcombe* (V); Dawson Harbour, July 1897, *Newcombe* (CAN).

MORESBY ISLAND: Copper Bay, *CST20972;* Alliford Bay, *CST21065;* Sandspit, *CST21096;* Chaatl Narrows, *CST21788;* Bag Harbour, *CST22192;* islet off Bolkus Islands, *CST22229;* Takakia Lake, *CST23053, Foster & Joslin 50A, 65* (UBC); Mt. de la Touche, *CT23588;* Anna Inlet, *CTS34922;* Church Creek, *Pillsbury 337* (DAO, UBC); Ikeda, June 10, 1913, *Newcombe* (UBC, V); Tasu Sound, 1901, *Newcombe* (V), June 26, 1961, *Foster & Bigg* (UBC); Skedans, May 1897, *Newcombe* (V); Lockeport, June 1, 1923, *Newcombe* (V); Mt. Moresby, July 13, 1961, *Foster & Bigg* (UBC); Peel Inlet, *Foster & Joslin 3, 5* (UBC).

Montia sibirica is one of the most common and widely distributed lowland species of the Queen Charlotte Islands. It is rare at high elevations, but was collected in gravel along the margins of a brook in a subalpine meadow at Takakia Lake where we camped in late July and early August in 1957. It is found in a wide range of moist, shady or open habitats such as stream banks, clearings and springy areas in coniferous woods, the upper margins of sea beaches, grassy lake margins, logged-over forest, alder thickets and exposed

grassy islets off the coast. It is a somewhat succulent perennial that shows a wide variation in stature, the shape and size of both the basal and cauline leaves, the color and size of the flowers, and the shape of the bracts. The long-petioled basal leaves vary from narrowly rhombic, ovate or elliptic to broadly rhombic, broadly elliptic or even circular, and there is corresponding variation in the sessile cauline leaves. The flowers may be white, pink, or white striped with pink, and the bracts vary from linear to elliptic. Such polymorphism partly accounts for the many segregates proposed, which include *M. alsinoides,* based on a collection from Nootka Sound, Vancouver Island; *M. asarifolia,* from Sitka in the Alaska panhandle; and *M. bulbifera* (Howell) A. Gray and *Limnia* (*Montia*) *bracteosa* Rydb. from California.

Montia sibirica is strictly a coastal species in the northern part of its range, but in southern British Columbia there is a disjunct interior population centered around Kootenay Lake and the nearby Arrow Lakes.

Caryophyllaceae

Calyx of united sepals ..... *Silene*
Calyx of free sepals
  Leaves with scarious stipules
    Leaves opposite; maritime ..... *Spergularia*
    Leaves whorled; nonmaritime ..... *Spergula*
  Leaves without stipules
    Petals bifid or deeply emarginate
      Capsules cylindric, often curved, dehiscence by terminal teeth, not valvate ..... *Cerastium*
      Capsules ovoid or ellipsoid, not curved, dehiscence valvate ..... *Stellaria*
    Petals entire or slightly emarginate
      Styles as many as the sepals, usually 4 or 5 ..... *Sagina*
      Styles fewer than the sepals, usually 3, if as many as the sepals, plants succulent ..... *Arenaria*

Arenaria

Tufted, mat-forming perennials; leaves linear-subulate, less than 1.3 mm wide, prominently 3-veined, often fasciculate ..... *A. stricta*
Upright perennials; leaves elliptic or ovate, more than 1.5 mm wide, with a single prominent midvein, never strongly fasciculate
  Leaves thin, up to 7 mm wide; stems not more than 0.5 mm in diameter, pubescent ..... *A. lateriflora*
  Leaves thick, fleshy, largest up to 20 mm wide; stems more than 1.3 mm in diameter, glabrous ..... *A. peploides*

249. Arenaria lateriflora L., Sp. Pl. 1: 423. 1753.
Moehringia lateriflora (L.) Fenzl, Vers. Darstell. Alsin. 18. 1833.

GRAHAM ISLAND: 2½ mi S of Tlell, *CST20886;* near Tow Hill, *CST21184, CST22663;* Lepas Bay, *CST22604;* Skidegate, July 1897, *Newcombe* (V).

Arenaria lateriflora is a wide-ranging circumboreal species of open woodlands and exposed habitats. It is of local occurrence on the Queen Charlotte Islands, where it is apparently restricted to the grass–sedge zone along the upper limits of sea beaches.

250. Arenaria peploides L. ssp. **major** (Hook.) Calder & Taylor, Can. J. Bot. 43: 1393. 1965.
A. peploides β *major* Hook., Fl. Bor.-Amer. 1: 102. 1831; *Honckenya peploides* ssp. *major* (Hook.) Hult., Fl. Aleut. Is. 171. 1937.
A. peploides var. *oblongifolia* (T. & G.) S. Wats., Bibl. Ind. N. Amer. Bot. 97. 1878.

GRAHAM ISLAND: Torrens Island, *CST22443, CT35830;* Lepas Bay, *CST22617;* Masset Spit, *CST22793;* Jungle Beach, *CST23399;* about 2 mi S of Rose Spit, *CT35911.*

Figure 122. *Montia sibirica* (L.) Howell in an open, east-facing rock runnel at about 1,000 feet near the head of Long Inlet, west of Queen Charlotte City, Graham Island.



MORESBY ISLAND: Chaatl Narrows, *CST21779;* Copper Bay, *CST-21877;* islet off Alliford Bay, *CST23232A;* South Low Island, *CTS34850;* Gowdas Islands, *CT36580.*

The Pacific coast entity, *A. peploides* ssp. *major,* is segregated from the typical phase on the basis of habit, leaf characteristics, and inflorescence. The unusual polygamodioecious nature of the flowers has been lucidly discussed by Wiggins and Thomas (1962, p. 169).

Arenaria peploides ssp. *major* is a common element of the coastal flora. It grows along the upper tidal zone among driftwood and occasionally extends into low-lying coastal sedge–grass swales.

251. Arenaria stricta Michx. ssp. **macra** (Nels. & Macbr.) Maguire, Amer. Midl. Nat. 46: 510. 1951.

A. tenella var. *puberulenta* Peck, Proc. Biol. Soc. Wash. 50: 121. 1937; *A. stricta* var. *puberulenta* (Peck) C. L. Hitchc., Vasc. Pl. Pacif. NW. 2: 262. 1964.

MORESBY ISLAND: Mosquito Lake, *CT23732A;* between Cumshewa and Peel inlets, *CT35172;* Mt. Moresby, *CT36386;* Mosquito Mtn., *CT36477.*

The collections of this entity from the Queen Charlotte Islands are being tentatively referred to *A. stricta* ssp. *macra,* which differs from the description given by Maguire (1958, p. 52) in that leaves are never more than 1.25 cm long and usually about 1 cm; and seeds are from 0.6 to 0.8 mm broad. Otherwise the characters are similar to those given by Maguire. The *A. stricta* complex along the Pacific Northwest coast is not well understood and the relationship of its members to other closely allied species is not clear.

The material from the Queen Charlotte Islands was collected on either gravel flats or in boulder-strewn runnels around or near the base of Mount Moresby. The single collection from Mosquito Lake was made on a gravel alluvial fan at the mouth of a small creek originating on the nearby north face of Mosquito Mountain.

Cerastium

Leaves and stems densely white-tomentose ..... *C. tomentosum*

Leaves and stems never tomentose

Plants annual; cymes glomerate or glomerulate; bracts of inflorescence herbaceous; fruiting pedicels shorter than calyx ..... *C. viscosum*

Plants perennial; cymes open; bracts of inflorescence scarious-margined; fruiting pedicels longer than calyx

Plants with conspicuous sterile shoots in the upper leaf axils; leaves of lower branches and offshoots marcescent ..... *C. arvense*

Plants with none of the immediately preceding characters
Petals longer than the sepals; stems and leaves with prominent gland-tipped hairs ..... *C. fischerianum*
Petals shorter than the sepals; stems and leaves hirsute without gland-tipped hairs ..... *C. vulgatum*

252. Cerastium arvense L., Sp. Pl. 1: 438. 1753.

GRAHAM ISLAND: Towustasin Hill, *CT35518;* Skidegate, June 22, 1901, *Newcombe* (V).

MORESBY ISLAND: Hotspring Island, *CST22303;* Limestone Island, *CST22412, CTS34830;* South Low Island, *CTS34837;* Low Island, *CTS35004.*

This cosmopolitan species of temperate regions undoubtedly has a number of well-defined races and is in need of a critical study. Plants from British Columbia are loosely matted and the stems, leaves and sepals are glandular-pubescent with nonglandular hairs intermixed with the glandular ones. Hultén (1944, p. 663) has stated that inland plants differ from those at the coast "in having shorter, more rigid leaves with prominent mid-nerve and broad stem-leaves." Plants of this type occur in dry prairie habitats in the Yukon, but farther south in British Columbia such plants are found both at the coast and in the interior. We have not been able to distinguish a coastal and an inland race as the shape, breadth, length and rigidity of the leaves are extremely variable in *C. arvense.* Plants with short, somewhat rigid leaves are usually found in areas of low rainfall and the expression of these characters seems to be merely a response to the environment. On the basis of the recent treatment of this species in *Flora Europaea* (Tutin *et al.,* 1964, p. 140) the collections from the Queen Charlotte Islands are referred to ssp. *arvense.*

Cerastium arvense is of local occurrence on the Queen Charlotte Islands. It is common on relatively dry cliffs and rocky outcrops along the shores of Limestone, Low, South Low and Hotspring islands off the east coast of Moresby Island. There is also a collection from Skidegate made by Newcombe in 1901. We found this species in 1964 on conglomerate outcrops at the base of Towustasin Hill near Juskatla.

253. Cerastium fischerianum Ser. in DC., Prodr. 1: 419. 1824.
C. alpinum β fischerianum (Ser.) Regel, Bull. Soc. Nat. Mosc. 35: 319. 1862.

GRAHAM ISLAND: Long Inlet, July 16, 1897, *Newcombe* (CAN– in part).

MORESBY ISLAND: Mitchell Inlet (Gold Harbour), June 6, 1897, *Newcombe* (V); Kaisun, July 1897, *Newcombe* (V).

The collections of *C. fischerianum* cited are somewhat atypical in that they are only moderately pubescent, having short glandular hairs on the stems, leaves,

pedicels, and calyces. In all other characters they are a good match for a series of this species we have seen in the herbarium of the National Museum at Ottawa. The occurrence of atypical populations at the periphery of plant ranges is not an unusual phenomenon.

We were aware that Newcombe had collected *C. fischerianum* a few times on the Charlottes but in spite of a thorough search it was not found in either the 1957 or 1964 survey. This species is at or near the southern limits of its North American range in the Queen Charlotte Islands.

254. *Cerastium tomentosum L., Sp. Pl. 1: 440. 1753.

MORESBY ISLAND: Alliford Bay, *CST21129.*

A few plants of *C. tomentosum* were found around the aircraft hangars and cannery at Alliford Bay not far from an abandoned rockery, where it was well established. This species prefers an oceanic climate and has only been collected as an escape west of the Coast Mountains in British Columbia and in the Maritime Provinces of eastern Canada.

255. *Cerastium viscosum L., Sp. Pl. 1: 437. 1753.
C. glomeratum Thuill., Fl. Paris ed. 2. 225. 1799.

GRAHAM ISLAND: Haida Pt., *CST20857;* between Queen Charlotte City and Skidegate Village, *CST20921;* Tlell, *CST34645.*

MORESBY ISLAND: near Alliford Bay, *CST21053;* Limestone Island, *CTS34822.*

Most European botanists consider *C. viscosum* to be a *nomen ambiguum* and would designate our plant *C. glomeratum.* We have no opinion as to which is the valid name so we are following American authors who consistently apply the name *C. viscosum* to this European adventive.

This species is common along roadsides and in disturbed ground in the settlements bordering Skidegate Inlet. It is also common on sand dunes and flats near the mouth of the Tlell River and a few plants were found on calcareous cliffs along the south shore of Limestone Island. *Cerastium viscosum* often grows in association with *C. vulgatum* L. but flowers from two to three weeks earlier.

256. *Cerastium vulgatum L., Sp. Pl. ed. 2. 627. 1762.

GRAHAM ISLAND: Masset Spit, *CST21236, CST22632;* 3 mi N of Lawnhill, *CST21726;* Langara Island, *CST22571;* Honna River, *CT35409;* Lawn Pt., *CT35446;* near mouth of Oeanda River, *CT35889;* Skidegate, May 30, 1923, *Newcombe* (V).

MORESBY ISLAND: between Sandspit and Cape Chroustcheff, *CST-20993;* near mouth of Deena River, *CT23794;* Sandspit, *CT35163;* Gray

Bay, *CT35235;* 5 mi E of Skidegate Lake, *Foster & Joslin 16* (UBC); Copper Bay, *Foster & Joslin 23* (UBC).

In *Flora Europaea* (Tutin *et al.,* 1964) this species has been included in the synonymy of *C. fontanum* ssp. *triviale* (Link) Jalas. However, we are following North American authors in referring our collections to *C. vulgatum.*

This species is a well-established European adventive found throughout the eastern and northeastern sections of Graham and Moresby islands respectively. It occurs in pastures, along roadsides and in waste places. Occasionally plants are found far from any habitation, for example, on a gravel bar at the mouth of the Deena River, on beach ridges at Gray Bay, and on sand dunes near the Oeanda River. In our 1957 survey of Langara Island it was common in a meadow at the abandoned Haida village of Dadens.

Sagina

Petals conspicuous, slightly exserted beyond calyx; sepals 5, erect in fruit; seeds 0.5 mm long; maritime ..... *S. maxima*

Petals inconspicuous, always shorter than calyx; sepals 4, occasionally 5, slightly divergent in fruit; seeds 0.2-0.3 mm long; nonmaritime ..... *S. procumbens*

257. Sagina maxima A. Gray, Mem. Amer. Acad. II. 6: 382. 1859.

S. crassicaulis S. Wats., Proc. Amer. Acad. 18: 191. 1883; *S. maxima* var. *crassicaulis* (S. Wats.) Hara, Rhodora 41: 392. 1939.

S. litoralis Hult., Fl. Kamtch. 5: 78. 1928.

GRAHAM ISLAND: Masset Spit, *CST21241;* 11½ mi E of Masset, *CST21306;* between Skidegate and Skidegate Village, *CST21412;* Empire Anchorage, *CS21443;* McClinton Bay, *CST21642;* Langara Island, *CST22543,* June 13, 1956, *Widdowson* (UBC); between Ells and Mercer pts., *CST-22891B;* Shields Bay, *CT23384;* Dawson Inlet, *CTS35144;* Naden Harbour, *CT36872;* Juskatla, *S3521.*

MORESBY ISLAND: Alliford Bay, *CST21049;* Chaatl Narrows, *CST-21741*; about 3 mi S of mouth of Copper Creek, *CST21888*; head of Cumshewa Inlet, *CST21969;* Bigsby Inlet, *CST22155;* Hotspring Island, *CST-22280;* Skedans Islands, *CST22388;* Limestone Island, *CST22424;* Fairfax Inlet, *CT23620A;* near mouth of Deena River, *CT23785;* Kootenay Inlet, *CT36221;* Kaisun, *CT36553,* July 14, 1897, *Newcombe* (CAN); Tasu, June 1901, *Newcombe* (V).

Sagina maxima, a maritime species of the northern Pacific coast, extends from California to Alaska and from Japan to Kamchatka. The relationship of this species to the coastal *Sagina* of Chile and to the European maritime species is relatively unknown. This perplexity is due in part to the phenotypic plasticity of the coastal entities and in part to the ability of perennials to behave as

annuals in dry coastal environments. The separation of species on the length of their life history is rather dubious and needs much further study. Controlled environmental studies should be utilized in future monographs of this genus to facilitate an analysis of the morphological variation.

We concur with the recent conservative treatment of Mizushima (1960), in which the entire northern Pacific population is considered to belong to a single species, *S. maxima*. The recognition of the Japanese and North American material as the same entity was first suggested by Hara (1939, p. 391, 392). The variation in seed coat sculpturing, glandulosity and life history as discussed by Mizushima (*op. cit.*) can be applied in part to the North American coastal population. However, we disagree with his statement that most of the plants are annual, for, as we indicate in the next paragraph, there is variation with respect to life span in this species, and we have good reason to believe they are essentially perennial. We are reluctant to recognize the forms proposed by Mizushima, as there may be an endless number of morphological variants that could be formalized in a species such as *S. maxima*. Hultén's species *S. litoralis* is included in the synonymy of *S. maxima* as the apparent distinctive characteristic of glandular pedicels and calyx can be found throughout the range of *S. maxima*. This same glandulosity can be found in the rather dubious annual species *S. occidentalis* S. Wats.

The Queen Charlotte Island population exhibits extensive morphological diversity. Plants collected in wet openings in alder thickets along the shoreline at Juskatla (*S3521*) were sprawling and poorly developed; in contrast, a collection made along an exposed rocky shoreline near Henslung Bay on Langara Island *(CST22543)* is comprised of sprawling and well-developed succulent plants. At this same habitat, large clumps of many upright plants, apparently acting as annuals, were collected in rock niches above the upper part of the beach. These three examples illustrate some of the variation that we observed in *S. maxima* and there is no reason to doubt that all three collections are part of the same taxon. *Sagina maxima* is one of the most common elements of the entire coastal flora of the Islands. It occurs on limestone bluffs, nitrogenous bird-rocks, sand–gravel beaches and occasionally in sedge meadows below spring-tide levels.

258. *Sagina procumbens L., Sp. Pl. 1: 128. 1753.

MORESBY ISLAND: between Cumshewa and Peel inlets, *CT35173;* between Skidegate Lake and Copper Bay, *CT36077.*

This Eurasian species has been widely introduced along roadsides and in cultivated fields along the Pacific coast. Although we have recorded *S. procumbens* from only two stations, it undoubtedly occurs elsewhere on the islands. At both sites it was growing on the wet gravelly margins of logging roads.

Silene

Broad-leaved upright annuals; capsules more than 1.8 cm long; lowland ..... *S. noctiflora*
Narrow-leaved cushion or matted perennials; capsules less than 1.3 cm long; alpine ..... *S. acaulis*

259. Silene acaulis L. ssp. **subacaulescens** (F. N. Williams) Hitchc. & Maguire, Univ. Wash. Publ. Biol. 13: 22. 1947. **Figure 123.**

MORESBY ISLAND: Takakia Lake, *CST23089, CT36346;* Mosquito Mtn., *CT36459.*

The taxonomic disposition of the three races of *S. acaulis* in North America can never be fully evaluated until a world-wide study of the complex is completed. Hultén (1958, p. 198) includes these North American races with Eurasian segregates in but a single species, *S. acaulis,* for the purposes of his discussion on amphi-Atlantic distributions. We are following the treatment of Hitchcock and Maguire for the North American entities (1947, p. 22) and recognize the plants on the Queen Charlotte Islands as ssp. *subacaulescens,* an essentially montane subspecies of the Cordilleran region. Our material possesses the long calyx and cylindrical capsule that characterizes the western segregate from the eastern and northern North American phase.

Silene acaulis is rare on the Islands. It was found only in alpine habitats and never formed the large showy colonies that are so characteristic of this species in other parts of its range.

260. *Silene noctiflora L., Sp. Pl. 1: 419. 1753.

MORESBY ISLAND: Sandspit, *CST23219.*

A single plant of *S. noctiflora* was found along the upper part of the sand beach on the outskirts of Sandspit along the road to Copper Bay.

Spergula

261. *Spergula arvensis L., Sp. Pl. 1: 440. 1753.

GRAHAM ISLAND: 4 mi S of Masset, *CST22806;* Queen Charlotte City, *CST23806;* Tlell, *CTS35081, CT35916;* 2 mi S of Masset, *CT36913.*

MORESBY ISLAND: Sandspit, *CT36044.*

Spergula arvensis is a variable species in habit, pubescence, and size and markings of seeds. Plants from the Queen Charlotte Islands comprise a uniform population except for the variable seed coat, which may be either smooth or covered with conspicuous white papillae. Ratter in *Flora Europaea* (Tutin *et al.,*



Figure 123. *Silene acaulis* L. ssp. *subacaulescens* (F. N. Williams) Hitchc. & Maguire in a montane region at the head of Seal Inlet, west coast of Graham Island. (Photograph courtesy Dr. A. Sutherland Brown.)

1964) does not recognize any segregates in this species in spite of the great variation.

This species is widely introduced in British Columbia and Alaska along roadsides, in grainfields, and in other disturbed habitats especially west of the Coast Mountains. All collections from the Charlottes are from the settled areas of eastern Graham and northeastern Moresby islands.

Spergularia

262. Spergularia canadensis (Pers.) G. Don, Gen. Hist. 1: 426. 1831.
S. marina sensu Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 37. 1921.

GRAHAM ISLAND: Queen Charlotte City, *CST22431;* Masset Spit, *CST22646, CT35698;* Dawson Inlet, *CST22848;* Tlell, *CST23170, CT35937,* July 24, 1925, *Newcombe* (V); Shields Bay, *CT23383;* Juskatla, *S3515;* Naden Harbour, *CT36867.*

MORESBY ISLAND: Copper Bay, *CST21872;* head of Cumshewa Inlet, *CST21973;* Echo Harbour, *CST22372;* mouth of Deena River, *CT23764A;* Gray Bay, *CT35247;* Kootenay Inlet, *CT36219;* Little Goose Bay, Louise Island, Sept. 10, 1951, *Pillsbury* (UBC); Dolomite Narrows, Burnaby Island, *Foster & Joslin 80* (UBC).

Rossbach (1940) recognized two subspecific entities of *S. canadensis* for the Pacific coast region. The coastal population north of Vancouver Island is referred to var. *canadensis,* a phase that also occurs on the Atlantic coast. The more southern Pacific coast population, var. *occidentalis* R. P. Rossb., extends from Vancouver Island south to California and is distinguished from the typical phase in having more glandulosity, a smaller ratio between capsule and calyx length, and a more erect habit. The differences separating these two segregates of *S. canadensis* are not always consistent within any one geographical region, as the differences depend upon the local ecological conditions. The environment particularly influences glandulosity and habit. The presence or absence of wings on the seeds is not a useful character, as pointed out by Rossbach (*op. cit.*). The plants from the Queen Charlotte Islands are provisionally recognized as belonging to the typical phase, although some plants have an upright habit and capsules that are not much longer than the calyx.

Spergularia canadensis is a common element of the vegetation in marshes and on mud flats along the coasts of the Queen Charlotte Islands.

Stellaria

Stems, petioles and pedicels pubescent in longitudinal lines ..... *S. media*
Stems, petioles and pedicels glabrous, or, if pubescent, never in longitudinal lines

Largest leaves at least 4 times as long as broad, lanceolate to linear-lanceolate
- Flowers in terminal membranous-bracteate cymes — *S. graminea*
- Flowers axillary, never in terminal membranous-bracteate cymes — *S. calycantha*

Largest leaves never more than 3 times as long as broad, ovate, elliptic or oblong
- Leaves elliptic or oblong, succulent, midvein inconspicuous and never prominently raised; salt marshes or saline mud flats — *S. humifusa*
- Leaves ovate, not succulent, midvein conspicuous and prominently raised; alpine or lowland, but never maritime
  - Leaves with margins minutely crisped, acuminate-tipped; lowland — *S. crispa*
  - Leaves with margins smooth, acute-tipped; alpine — *S. longipes*

263. Stellaria calycantha Bong., Mém. Acad. St. Pétersb. VI. 2: 127. 1832.

S. borealis Bigel., Fl. Bost. ed. 2. 182. 1824.

S. sitchana Steud., Nom. Bot. ed. 2. 2: 637. 1841; *S. borealis* var. *sitchana* (Steud.) Fernald, Rhodora 16: 151. 1914.

S. borealis var. *bongardiana* Fernald, *Rhodora* 16: 151. 1914; *S. sitchana* var. *bongardiana* (Fernald) Hult., Fl. Alaska & Yukon 4: 659. 1944.

GRAHAM ISLAND: Yakan Pt., *CST21307;* Skidegate, *CST21429, CST21699;* Langara Island, *CST22572;* Lepas Bay, *CST22597;* Juskatla, *T125;* Tlell, *CT35928.*

MORESBY ISLAND: Alliford Bay, *CST21857;* head of Cumshewa Inlet, *CST21964;* Gray Bay, *CST23433;* Mosquito Mtn., *CT23740;* Takakia Lake, *CT36357;* Mt. Moresby, *CT36409;* Kaisun, *CT36555;* Sandspit, *Joslin 71* (UBC).

The *S. calycantha* complex is in a state of taxonomic confusion and the problem of determining relationships within the complex is beyond the scope of this *Flora.* We are recognizing only a single taxon from the Queen Charlotte Islands and adjacent coast and include under our broad concept of this species *S. sitchana* Steud. and *S. sitchana* var. *bongardiana* (Fern.) Hult.

Stellaria calycantha is typically a lowland coastal species on the Queen Charlotte Islands, but two collections were made in montane meadows. Plants from the Islands may have serrulate, ciliate or tuberculate leaf margins and may be up to 5 dm tall with the largest leaves up to 6 cm long. Sepals attain a length of 4.5 mm.

264. Stellaria crispa Cham. & Schlecht., Linnaea 1: 51. 1826.

GRAHAM ISLAND: Queen Charlotte City, *CST20908;* mouth of Sangan River, *CST21147;* 3½ mi S of Masset, *CST21277;* Empire Anchorage, *CS21441;* Langara Island, *CST22559,* June 1, 1952, *Guiget* (V), June 13, 1956, *Widdowson* (UBC); 2½ mi SE of Port Clements, *CTS34600;* Dawson Inlet, *CTS35128;* Towustasin Hill, *CT35530;* Juskatla, *S3511;* Marie Lake, *T91;* Mamin River Delta, May 30, 1952, *Schmidt;* Skidegate, May 29, 1923, *Newcombe* (V).

MORESBY ISLAND: head of Cumshewa Inlet, *CST20957;* Skidegate Lake, *CST21005;* near Alliford Bay, *CST21072;* Chaatl Narrows, *CST21800;* islet in Huston Inlet, *CST22197;* East Copper Island, *CST22220;* Hotspring Island, *CST22277;* Mt. de la Touche, *CT23547;* between Cumshewa and Peel inlets, *CT35211;* Skedans, April 26, 1901, *Newcombe* (V).

Stellaria crispa occurs throughout the Queen Charlotte Islands. It is essentially a lowland species but was collected on a sparsely vegetated talus slope near tree line on the east slope of Mount de la Touche at Tasu Sound and was noted in subalpine meadows at Takakia Lake. It is common in the driftwood zone along the upper margins of sea beaches, in logged-over forest, on disturbed roadside banks, in open woods, and on open bluffs and cliffs at the shoreline. It usually occurs in moist habitats and does not withstand severe competition from other herbaceous species.

265. *Stellaria graminea L., Sp. Pl. 1: 422. 1753.

GRAHAM ISLAND: Queen Charlotte City, *CT36516.*

Stellaria graminea is not a widely introduced plant of the Cordilleran region of North America. The single collection from the Queen Charlotte Islands was made in loose shale and sandy soil near the Community Center at Queen Charlotte City. This species usually occurs on light disturbed soils in gardens or on roadsides.

266. Stellaria humifusa Rottb., Skr. K. Danske Vid. Selsk. 10: 447. 1770.
S. humifusa var. *oblongifolia* Fenzl in Ledeb., Fl. Ross. 1: 384. 1841.

GRAHAM ISLAND: Delkatla Inlet, *CST21293, CT35591;* 11½ mi E of Masset, *CST21305;* McClinton Bay, *CST21641;* Kumdis Creek Delta, *CST22107, CT36127;* Queen Charlotte City, *CST23038;* Juskatla Inlet, *S3516;* Naden Harbour, *CT36863.*

MORESBY ISLAND: Copper Bay, *CST21875;* Moresby Logging Camp, *CST21972;* Bag Harbour, *CST22185;* mouth of Deena River, *CT23784.*

Numerous attempts have been made to establish infraspecific taxa within this wide-ranging circumboreal species, but nearly all modern authors recognize



Figure 124. *Nuphar luteum* (L.) Sibth. & Sm. ssp. *polysepalum* (Engelm.) Beal, habit.

only a single taxon. Some of the problems that have beset authors are intimately linked to the plastic phenotypic expression that *S. humifusa* assumes under varying environmental conditions. Examination of our collections from the Queen Charlotte Islands reveals correlation of habit and leaf form with habitat. Plants that grow in competition with grasses and sedges along the upper portions of beaches are elongate and twining, and have few branches and larger leaves than plants on exposed tidal flats and gravel beaches. The former phenotype has been commonly designated as *S. humifusa* var. *oblongifolia* Fenzl, but this variety represents no more than a specialized ecoform. All variations between the two extreme phenotypes can be usually found at any one beach locality.

Stellaris humifusa is a common element of the coastal strand flora along the northern and eastern coasts of Graham and Moresby islands and along the shores of Masset and Juskatla inlets.

267. Stellaria ? longipes Goldie, Edinb. New Phil. J. 6: 327. 1822.

MORESBY ISLAND: Takakia Lake, *CT36335*.

A single small sterile colony of this species was found on a stabilized talus fan at the bottom of a north-facing rocky runnel at about 2,000 ft along the south shore of Takakia Lake. We are tentatively referring this collection to *S. longipes*, but definitive identification must await a flowering and fruiting collection.



Figure 125. *Nuphar* colony in a bog pool between Tlell and Port Clements.

268. *Stellaria media (L.) Vill., Hist. Pl. Dauph. 3: 615. 1789.

GRAHAM ISLAND: Haida Pt., *CST20876;* between Queen Charlotte City and Skidegate Village, *CST20921A;* near Lawnhill, *CST20900;* Queen Charlotte City, *CST22470;* Masset Spit, *CST22634;* Tow Hill, *CTS34760;* Tlell, *CTS34650, CTS35080.*

MORESBY ISLAND: between Sandspit and Cape Chroustcheff, *CST-20987;* Sandspit, *CT35353;* Kaisun, *CT36537;* Skedans, April 1901, *Newcombe* (V).

Stellaria media is a common and well-established weed in the settled areas of eastern Graham and northeastern Moresby islands. The only collection from the west coast was made at the abandoned Haida village of Kaisun where it was found in meadows immediately back from the shoreline. This species was collected in pastures, along roadsides, and in other disturbed habitats.

Nymphaeaceae

Nuphar

269. Nuphar luteum (L.) Sibth. & Sm. ssp. **polysepalum** (Engelm.) Beal, J. Elisha Mitchell Soc. 72: 339. 1956. **Figures 59, 66, 124 and 125.**
N. polysepalum Engelm., Trans. Acad. St. Louis 2: 283. 1865.

GRAHAM ISLAND: near Tow Hill, *CST21165;* Langara Island, *CST-22513;* 9 mi S of Juskatla, *T73;* 6½ and 9 mi SE of Port Clements, *CTS34619, T136;* 10 mi N of Port Clements, *CTS34713;* 4 mi NW of Tlell, *CT35461;* near Skidegate, July 16, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: White Swan Bog, *CST21037;* Upper Victoria Lake, *CT35790.*

In a revision of *Nuphar* for Europe and North America, Beal (1956) recognized the single polymorphic species *N. luteum* with nine subspecies. This conservative treatment is a marked improvement over the earlier works of Morong (1886) and Miller and Standley (1912). Only two of the subspecies recognized by Beal occur in western North America, ssp. *variegatum* (Engelm. ex Clinton) Beal (=*N. variegatum*) and ssp. *polysepalum*. We fully agree with Beal that these two taxa are best treated as subspecies of a single wide-ranging taxon. These two subspecies can be distinguished as follows:

Petioles conspicuously flattened and winged; sepals usually red-tinged (occasionally yellow) within ... ssp. *variegatum*

Petioles terete, sepals almost always yellow-tinged within ssp. *polysepalum*

The flowers of ssp. *polysepalum* are usually large and have 7 to 12 sepals in comparison with the usually smaller-flowered and fewer-sepaled ssp. *variegatum*. Although the flower size and sepal color and number are not entirely reliable for separating the two subspecies, the shape of the petiole seems to be a consistent character.

In the northern part of its range ssp. *variegatum* extends from the Atlantic coast to the foothills of the Rocky Mountains and northwest to central Yukon. Its presence in northeastern British Columbia and central Yukon is not surprising as a number of other species have similar distribution patterns. In all probability these species were centered south of the Great Lakes during the last glaciation, and with the withdrawal of the icesheet they migrated north and westward. The more westerly ssp. *polysepalum* is widely distributed in Alaska and occurs throughout British Columbia, except in the northeast section of the province.

The yellow pond-lily is common in lowland and subalpine lakes and ponds throughout the Queen Charlotte Islands.

Ranunculaceae

Fruit an achene

Petals present, usually yellow; sepals usually 5, green; terrestrial or aquatic ... *Ranunculus*

Petals absent; sepals petal-like, never yellow, terrestrial

Flowers solitary or umbellately cymose ... *Anemone*

Flowers in loose racemes ... *Thalictrum*

Fruit a follicle or berry
- Fruit a berry; inflorescence terminating in a many-flowered congested raceme ..... *Actaea*
- Fruit a follicle; inflorescence never terminating in a many-flowered congested raceme
  - Leaves simple, entire or palmately dissected
    - Flowers regular, not in a raceme; sepals petaloid, yellow or white ..... *Caltha*
    - Flowers irregular, in a raceme; sepals petaloid, purple ..... *Aconitum*
  - Leaves compound
    - Flowers bicolored, red and yellow; petals spurred; follicles erect, many-seeded ..... *Aquilegia*
    - Flowers concolored, white or greenish white; perianth parts never spurred; follicles divergent, few-seeded
      - Leaves evergreen, coriaceous, sharply serrulate; follicles in an umbellatelike head, conspicuously stipitate ..... *Coptis*
      - Leaves deciduous, never serrulate; follicles in a congested head, sessile ..... *Isopyrum*

Aconitum

270. Aconitum delphinifolium DC., Syst. Veg. 1: 380. 1818.

A. delphinifolium ssp. *chamissonianum* (Reichenb.) Hult., Fl. Alaska & Yukon 4: 724. 1944.

MORESBY ISLAND: Takakia Lake, *CST23044, CT36317.*

Hultén (1944, p. 724-726) recognizes three subspecies in the *A. delphinifolium* complex and indicates the possibility of a fourth taxon in the southern part of the Alaska panhandle. One subspecies, *A. dephinifolium* ssp. *paradoxum* (Reichenb.) Hult., is restricted to the outer Aleutian Islands of the Bering Sea region and is not relevant to our discussion. The other two subspecies, *chamissonianum* and *delphinifolium,* are found in central and southeastern Alaska, Yukon, and adjacent British Columbia. These two taxa have similar flowers and habit but are segregated by Hultén on the basis of size of the leaf lobes.

We have examined many specimens from both coastal and inland localities but we have been unable to distinguish the two subspecies in all instances. Habitat data indicate that morphological variation can be frequently correlated with site. Although coastal and inland races exist in a number of other species from this region, we are reluctant to recognize any infraspecific taxa within *A. delphinifolium* for this area until the morphological evidence can be more closely correlated with the taxonomic entities that have been proposed. We are

referring all Queen Charlotte Island and adjacent mainland collections to the typical phase.

Aconitum delphinifolium is rare on the Islands and was only noted at Takakia Lake. The colony at this station was not large and few plants produced flowers. A collection by Green (UBC) labeled "Sept. 16, 1914, Tlell River" is almost certainly in error as to locality because this species is only found in subalpine meadows.

Actaea

271. Actaea rubra (Ait.) Willd. ssp. **arguta** (Nutt.) Hult., Fl. Alaska & Yukon 4: 717. 1944.

A. arguta Nutt. ex T. & G., Fl. N. Amer. 1: 35. 1838.

GRAHAM ISLAND: Honna River, May 24, 1923, *Newcombe* (V).

MORESBY ISLAND: 3 mi S of Copper Bay, *CST21883;* between Skidegate Lake and Copper Bay, *CT23673*.

The North American *A. rubra* is made up of two races, ssp. *rubra* and ssp. *arguta*. The typical phase has a simple racemose terminal inflorescence which is usually short and compact, and in fruit the peduncle is usually at least twice as long as the inflorescence. In Canada ssp. *rubra* extends from the Atlantic coast to the Rocky Mountains and northwards to central Yukon and probably Alaska. The terminal inflorescence of ssp. *arguta* is usually longer and less compact, and often has a single, long-pediceled flower or a few-flowered raceme in the axil of the uppermost leaf. Frequently the lowermost 1 to 2(-5) flowers of the terminal raceme are set apart from the main body of the inflorescence. When the plant is in fruit the peduncle is usually less than twice as long as the inflorescence, and in extreme cases, such as in some Vancouver Island collections, it may be only half as long. This subspecies is widely distributed in the coastal belt of Alaska, central and southern Yukon, and British Columbia, and it occurs sporadically throughout Alberta. Where the two subspecies meet along the east flank of the Rocky Mountains there is a broad zone of intergradation and colonies comprising both races have been found. We have seen a few collections from Saskatchewan that approach ssp. *arguta*.

In his treatment of the flora of Alaska and Yukon, Hultén stated that ssp. *arguta* was strictly coastal and that all plants from the interior should be referred to ssp. *rubra*. However, the characters he considered diagnostic for separating the two races, such as the width of the leaflets, the amount of pubescence, the degree of leaf dissection, and the shape and size of the fruit are of little significance.

Actaea rubra ssp. *arguta* is closely related to or possibly identical with the Eurasian *A. erythrocarpa* Presl. We have been unable to reach a decision regarding their taxonomic relationship as we only examined a few specimens of the Eurasian species.

Actaea is rare in the Queen Charlotte Islands. It has been found only in open woods along the Honna River near Queen Charlotte City and in two places

along Copper Creek south of Sandspit. A 1913 Newcombe collection (UBC) from the Islands is not specific as to locality.

ANEMONE

Achenes glabrous ..... *A. narcissiflora*
Achenes densely villous
  Plants rhizomatous; basal leaves ternate; petioles inconspicuously pubescent ..... *A. parviflora*
  Plants with a stout branching caudex; basal leaves 2-3 times ternate; petioles conspicuously pubescent .. *A. multifida*

272. Anemone multifida Poir. in Lam., Encycl. Méth. Bot. 1: 364. 1810.

MORESBY ISLAND: Limestone Island, *CTS34814,* June 9, 1913, *Newcombe* (V).

Anemone multifida and its segregates are widely distributed in the western hemisphere. Although this species was described by Poiret from a collection made in the Straits of Magellan, its best development is in North America. Hultén (1944, p. 732) states that plants from Alaska and Yukon cannot be distinguished from those of South America. Recent studies by Boraiah and Heimburger (1964) on the cytotaxonomy of this species complex reveal it to be cytologically homogeneous and they have stated that the morphological diversity is of minor importance. It is unfortunate that they did not clarify the incongruous treatment accorded the complex by Boivin (1951 and 1960) by correlating their cytological findings with morphology and available knowledge of plant distributions. It is beyond the scope of this flora to study the complex in detail and we refer the two collections from the Queen Charlotte Islands to *A. multifida* in the broad sense.

Anemone multifida occurs only on dry limestone bluffs along the shores of Limestone Island off the coast of Louise Island (*see* Figure 95).

273. Anemone narcissiflora L. ssp. **alaskana** Hult., Fl. Alaska & Yukon 4: 733. 1944.

GRAHAM ISLAND: Tan Mt., *CST21581;* Shields Bay, *CT23295;* Jalun Lake, *CT35636;* Mt. Needham, June 18, 1961, *Foster & Bigg* (UBC).

MORESBY ISLAND: Newcombe Peak, *CST22036;* Takakia Lake, *CST-23074, CT36285;* Mt. de la Touche, *CT23573;* Yatza Mtn., *CT35707;* Mt. Russ, *CT36150;* Mt. Moresby, *CT36443;* Canoe Pass, July 26, 1910, *Spreadborough* (CAN).

A number of segregates have been proposed for the widely distributed *A. narcissiflora* of Eurasia and western North America. Hultén, in *Flora of Alaska and Yukon,* recognized four: ssp. *villosissima* (DC.) Hult., which extends from the Aleutians to Kodiak Island and is present in the Kuriles, Kam-

chatka, and Commander Islands of eastern Asia; ssp. *alaskana* Hult., which ranges along the Alaska coast from the Alaska Peninsula to the Queen Charlotte Islands; ssp. *sibirica* (L.) Hult., which is centered around the Bering Straits but extends southward to the Gulf of Alaska; and ssp. *interior* Hult. of central Alaska, Yukon, northern interior British Columbia and the east flanks of the Richardson and Mackenzie mountains in the Mackenzie District. Unfortunately, Hultén made no attempt to compare these four races with the many segregates recognized by Juzepczuk in *Flora URSS,* nor did he clearly differentiate the four subspecies he recognized.

We have examined about 125 collections from the Pacific Northwest, but we have not seen enough material from the Aleutians, the Alaska Peninsula and the shores of the Bering Sea to evaluate these segregates adequately. We are provisionally recognizing Hultén's four subspecies, which can be placed in two groups, one including sspp. *villosissima* and *alaskana* and one comprising sspp. *interior* and *sibirica*. Plants of the latter group have sparsely pubescent petioles and stems with glabrous or sparsely pubescent leaves, which are smaller and more deeply dissected, and have narrower and fewer segments than plants of the first group. Plants of the interior and Bering Sea races present a more open appearance and there is a tendency for the plants to be single flowered. The coastal population (sspp. *villosissima* and *alaskana*), extending from the Aleutians to the Queen Charlotte Islands, is made up of more robust plants with thick masses of persistent leaf bases and pubescent leaves. Their petioles and stems are conspicuously pubescent with spreading hairs, and the leaf segments are often more sharply pointed. According to Hultén, ssp. *alaskana* differs from ssp. *villosissima* in that the leaves are less villous and have petiolated lobes and the plant bears few flowers. Plants from the Queen Charlotte Islands are of this type, with usually one to three flowers per stem and the primary divisions of the leaves distinctly petiolate. Intermediates are frequent where the two subspecies meet along the coast of the Gulf of Alaska.

In the Queen Charlotte Islands *A. narcissiflora* is restricted to the Queen Charlotte Ranges, where it usually occurs in rock niches or on cliff ledges in the alpine or subalpine zones. Occasionally it extends to almost sea level on the west coast in open, exposed, rocky habitats. It is an early flowering species which was in full bloom on June 18 in 1957 when we surveyed Tan Mountain at the head of McClinton Bay on the southwest side of Masset Inlet.

274. Anemone parviflora Michx., Fl. Bor.-Amer. 1: 319. 1803.

MORESBY ISLAND: Takakia Lake, *CT36345*.

Anemone parviflora, a widely distributed alpine and lowland species of the mountainous regions of the Pacific Northwest, ranges eastwards in the northern part of the boreal zone to the Atlantic coast. It also occurs at isolated stations to the south in Minnesota and Colorado as well as the Bering Sea region of eastern Asia. There are many records from the interior mountain ranges of Alaska and British Columbia but it only occurs sporadically in the Coast Mountains south of the Alaska panhandle. *Anemone parviflora* is a

variable species with contrasting characters. It may be essentially glabrous or conspicuously pubescent, the flowers are large or small, and the tepals are entirely white or bluish white. In spite of its variations, however, we have been unable to distinguish any races in this wide-ranging species.

On the Queen Charlotte Islands one small colony was found on a limestone outcrop above the south side of Takakia Lake at an elevation of 2,300 to 2,500 ft.

Aquilegia

275. Aquilegia formosa Fisch. in DC., Prodr. 1:50. 1824.
A. columbiana Rydb., Bull. Torrey Club 29: 145. 1902.
A. formosa var. *megalantha* Boivin, Amer. Midl. Nat. 50: 510. 1953.

GRAHAM ISLAND: Haida Pt., *CST20880;* Tow Hill, *CST21180* (DAOM), *CST22657;* 2½ mi S of Tlell, *CST21342;* McClinton Bay, *CST-21646;* Lepas Bay, *CST22622A;* between Ells and Mercer pts., *CST22885;* between Skidegate and Skidegate Village, *CTS34664;* Blackwater Creek, *CTS-35057;* Mamin River, Juskatla, June 15, 1952, *Schmidt;* Skidegate, June 13 and 30, 1910, *Spreadborough* (CAN), June 1, 1914, Green (UBC), May 24, 1923, *Newcombe* (V); Dawson Harbour, June 27, 1897, *Newcombe* (V).

MORESBY ISLAND: Copper Bay, *CST20976, Foster & Joslin 38* (UBC); East Copper Island, *CST22198;* Echo Harbour, *CST22324;* Limestone Island, *CST22400;* Takakia Lake, *CST23045;* Mt. de la Touche, *CT-23567;* Mosquito Mtn., *CT23749;* South Low Island, *CTS34845;* Low Island, *CTS35010;* Mosquito Lake, *CT35306;* Kaisun, *CT36568;* Kitgoro Inlet, June 30, 1897, *Newcombe* (CAN).

Plants of *A. formosa* from coastal British Columbia and Alaska are often large flowered (var. *megalantha*) with tepals up to 30 mm in width. However, plants with large flowers closely approaching these measurements are not uncommon east of the Coast Mountains. On the other hand, plants that have short and narrow tepals occur in both lowland and alpine areas on Vancouver Island and the Queen Charlotte Islands. About 150 collections from north of the United States border were examined; but no consistent differences could be found between the inland and coastal populations.

On the Charlottes, *A. formosa* is common in open habitats, especially near the coast, but it occurs throughout the Islands from sea level to well above tree line in the mountain ranges.

Caltha

Flowering stems several-leaved, decumbent; tepals yellow ..... *C. palustris*
Flowering stems with 1 or occasionally 2 leaves, erect; tepals white ..... *C. biflora*

276. Caltha biflora DC., Reg. Veg. Syst. Nat. 1: 310. 1817.

GRAHAM ISLAND: Tan Mtn., *CST21584;* Shields Bay, *CT23348;* Blackwater Creek, *CTS35073;* Jalun Lake, *CT35653;* Mt. Needham, June 18, 1961, *Foster & Bigg* (UBC); Slatechuck Mtn., May 24 and 30, 1923, *Newcombe* (V); Skidegate, July 11, 1910, *Spreadborough* (CAN); north of Skidegate, August 2, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: Takakia Lake, *CST23041, CT36287, Foster & Joslin 62* (UBC); Mt. de la Touche, *CT23582;* Mosquito Mtn., *CT23741;* Mt. Russ, *CT36146;* Mt. Moresby, *CT36495;* Sunday Inlet, *CT36607;* Gawi, June 1, 1901, *Newcombe* (V); Canoe Pass, July 26, 1910, *Spreadborough* (CAN).

Caltha biflora, a subalpine or alpine species in the Queen Charlotte Ranges, occasionally extends to near sea level in exposed situations on the west coast. Although it occurs in a wide range of habitats it is rarely a conspicuous element of the vegetation. Along the mainland coast and on Vancouver Island it is a lowland species of swamps and boggy habitats. In the alpine zone the genus is represented by *C. leptosepala* DC. All collections from the Queen Charlottes belong to the typical phase, ssp. *biflora,* which in the northern part of its range is restricted to coastal Alaska and British Columbia.

Carter and Newcombe (1921, p. 39) reported *C. leptosepala* from the Queen Charlotte Islands, but there are no herbarium collections to substantiate Dr. C. F. Newcombe's record at either the Provincial Museum in Victoria or the University of British Columbia at Vancouver. This species was not found in any of the alpine areas surveyed in the Islands.

277. Caltha palustris L. ssp. **asarifolia** (DC) Hult., Fl. Alaska & Yukon 4: 712. 1944.

C. asarifolia DC., Reg. Veg. Syst. Nat. 1: 309. 1817.

GRAHAM ISLAND: Yakan Pt., *CTS34768.*

We are tentatively referring a lowland collection of *Caltha* comprising three small vegetative plants from wet coastal meadows at Yakan Point to *C. palustris* ssp. *asarifolia.* This collection differs from all material of *C. biflora* from the Charlottes in having subentire leaves that are longer than broad or about equal in width and length. It should be pointed out that the Yakan Point collection of *Caltha* is an isolated one approximately 45 miles from the range of the essentially montane *C. biflora.* It was growing in the same type of lowland habitat in which *C. palustris* ssp. *asarifolia* is found in on the mainland.

Coptis

Leaves pinnately 5-foliolate; beaks of mature follicles inconspicuous and not sharply differentiated from the body ..... *C. asplenifolia*

Leaves trifoliolate; beaks of mature follicles conspicuous, 2.0-2.5 mm long ..... *C. trifolia*

278. Coptis asplenifolia Salisb., Trans. Linn. Soc. 8: 306. 1807.

GRAHAM ISLAND: about 7½ mi S of Masset, *CST21260;* near Tow Hill, *CST21335;* 1½ mi SE of Port Clements, *CST21389;* Empire Anchorage, *CS21484, CS21512;* Tąn Mtn., *CST21588;* near Skidegate, *CST21687;* Langara Island, *CST22514,* May 21, 1952, *Beebe* (V); Dawson Inlet, *CST22934;* Shields Bay, *CT23312;* 10 mi SSE of Juskatla, *T6;* Marie Lake, *T89;* 10 mi N of Port Clements, *CTS34723;* White Creek Muskeg, *CTS34767;* Jalun Lake, *CT35678;* Yakoun River, June 13, 1952, *Schmidt;* Skidegate, June 1901, *Newcombe* (V); Masset, 1929, *Young* (V), Sept. 25, 1912, *Green* (UBC).

MORESBY ISLAND: head of Cumshewa Inlet, *CST21042;* Chaatl Narrows, *CST21770;* Bigsby Inlet, *CST22143;* Echo Harbour, *CST22376;* Takakia Lake, *CST23103, CT36349;* Mt. de la Touche, *CT23578;* Anna Inlet, *CTS-34937;* between Cumshewa and Peel inlets, *CT35171;* Upper Victoria Lake, *CT35805;* Kootenay Inlet, *CT36155;* Sunday Inlet, *CT36629;* Canoe Pass, June 23, 1897, *Newcombe* (CAN).

Coptis asplenifolia is one of the most common and widely distributed species on the Islands. It is found throughout the bogs and coniferous forests of the eastern lowlands and from sea level to alpine summits in the Queen Charlotte Ranges. Our field notes indicate the diversity of habitats: hummocks in open sphagnum bogs, grassy alpine slopes, open coniferous woods, wooded talus slopes, and cliffs and rocky runnels on mountain slopes. In the climax hemlock-spruce forest where little light reaches the forest floor plants rarely flower or fruit. There is considerable variation in the shape and size of the mature follicles from one colony to another but this morphological variation is apparently of no taxonomic significance.

279. Coptis trifolia (L.) Salisb., Trans. Linn. Soc. 8: 305. 1807, in part.

GRAHAM ISLAND: 3½ mi NW of Tlell, *CST20937;* near Tow Hill, *CST21164, CST21336;* 7½ mi S of Masset, *CST21261;* about 6½ and 8 mi SE of Port Clements, *CTS34615, CST21355;* Langara Island, *CST22514A;* White Creek Muskeg, *CTS34740.*

MORESBY ISLAND: Anna Inlet, *CTS34986.*

In a study of *C. trifolia* in 1930, Fernald recognized the plant of eastern North America and Greenland as a distinct species, *C. groenlandica* (Oeder) Fernald. Subsequently Hultén (1937, p. 177) in *Flora of the Aleutian Islands* treated Fernald's species at subspecific rank, stating that there were racial differences between the eastern and western populations but that these differences were not always sharply defined. Later, in *Flora of Alaska and Yukon,* Hultén (1944, p. 715) reversed his earlier decision and considered the differ-

ences so slight and individual variation so great that it would be unrealistic to recognize the two races. This latter decision was supported by Hara (1952, p. 51) when he compared Japanese to North American material.

Unfortunately we have seen no material of *C. trifolia* from eastern Asia, but we have examined 30 collections of this species from along the British Columbia – Alaska coast and a large series of specimens from eastern North America. We agree with Fernald that the two populations are distinct, but consider some of the characters he believed were of taxonomic significance for separating the two races to be unreliable. Among these are the length of the petioles of the larger leaves, petiolate versus sessile leaflets, the shape of the petals, the number of carpels, the length of the body of the mature follicle and the length of the follicle beak. The two most reliable characters we have found for distinguishing the western ssp. *trifolia* from the more eastern ssp. *groenlandica* (Fern.) Hult. are the shape of the sepals and seeds. In the former the sepals are abruptly petiolate and the seeds are quadrate in cross section, while in the latter the sepals are gradually narrowed to the base and the seeds are round.

All collections from coastal British Columbia and Alaska belong to ssp. *trifolia*. The more eastern ssp. *groenlandica*, which Fernald recorded only as far west as Manitoba, has been found in recent years in Saskatchewan and Alberta. There is also a single record of *C. trifolia* from Aleza Lake in the interior of British Columbia, but we have not critically examined this collection, which is in the herbarium of the University of British Columbia. We suspect it belongs to ssp. *groenlandica* because a number of boreal species have migrated westwards through the low passes of the Rocky Mountains into central British Columbia between 54° and 56°N.

The collections from the Queen Charlotte Islands, with the exception of one from Langara Island and another from Anna Inlet, Moresby Island, are from sphagnum bogs in the northeast section of Graham Island. This species is usually found on the drier sphagnum hummocks and, although it is common in many places, very few plants produce flowers.

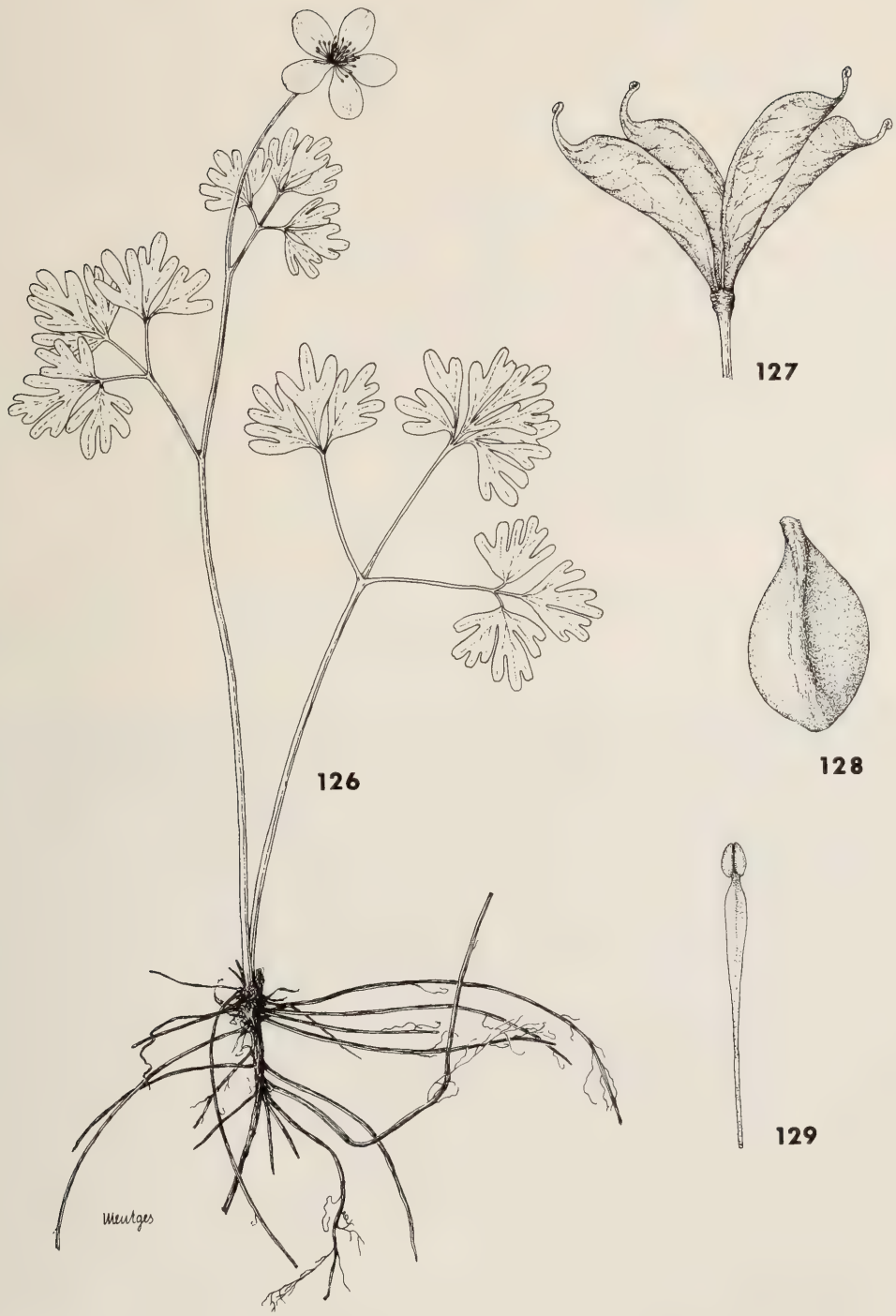
Isopyrum

280. Isopyrum savilei Calder & Taylor, Madroño 17: 70. 1963. **Figures 126-130.**

GRAHAM ISLAND: Empire Anchorage, *CS21464;* Tan Mtn., *CST-21578;* Shields Bay, *CT23294, CT23375;* Long Inlet, *CT35963.*

MORESBY ISLAND: Takakia Lake, *CST23055* (Holotype), *CT36330, Foster & Joslin 56* (UBC); Mt. de la Touche, *CT23566;* Mosquito Mtn., *CT23721;* Mt. Russ, *CT36133;* Mt. Moresby, *CT36494A;* Sunday Inlet, *CT-36636;* Tasu Sound, June 26, 1961, *Foster & Bigg* (UBC).

Isopyrum savilei can be readily distinguished from the related Japanese and other North American species. Its morphology, distribution and relation-



Figures 126–129. *Isopyrum savilei* Calder & Taylor. 126. Habit (× ½). 127. Fruit (× 2). 128. Seed (× 10). 129. Stamen (× 5).

ship to other species in the genus have been fully discussed by the authors in a recent paper (1963).

This species is restricted to the Queen Charlotte Ranges. Here it is usually found at high elevations but occasionally it extends almost to sea level, especially on the exposed west coast of the Islands. It occurs in moist shady rock runnels or in cliff crevices, and sometimes extends on to talus slopes. Although it was noted in all alpine areas except Yatza Mountain above Upper Victoria Lake, it is never a conspicuous element of the vegetation. *Isopyrum savilei* is a delicate perennial with large, showy white flowers, and would be an interesting addition to rock gardens in coastal areas of the Pacific Northwest.

RANUNCULUS

Plants erect, rarely stoloniferous, never aquatic
  Plants with large showy yellow flowers
    Plants scapose; basal leaves orbicular, glabrous, simple, ultimate segments blunt-tipped ..... *R. cooleyae*
    Plants never scapose; basal leaves suborbicular or cordate, often compound and 3- to 5-pinnate, ultimate segments acute-tipped
      Terminal segment of basal leaves stalked

Figure 130. *Isopyrum savilei* Calder & Taylor with *Adiantum pedatum* L. ssp. *aleuticum* (Rupr.) Calder & Taylor on cliffs along margin of runnel at about 1,000 feet near the head of Long Inlet, west of Queen Charlotte City, Graham Island.



- Stolons present; basal leaves trifoliolate; achene beaks curved, ca. 1 mm long; lower portion of stem conspicuously pubescent ..... *R. repens*
- Stolons absent; basal leaves trifoliolate or frequently 5-pinnate; achene beaks essentially straight, 3-4 mm long; lower portion of stem never conspicuously pubescent ..... *R. orthorhynchus*

Terminal segment of basal leaves never stalked

- Petals usually 5, nearly as broad as long; plants essentially glabrous or with tawny spreading pubescence at base of petioles
  - Plants essentially glabrous; petals 4-6 mm long; achenes ca. 2 mm long, ca. 1 mm wide, with delicate straight beaks; alpine ..... *R. eschscholtzii*
  - Plants tawny pubescent at base of petioles; petals 9-12 mm long; achenes ca. 2.5 mm long, ca. 2 mm wide, with stout hooked beaks; lowland ..... *R. acris*
- Petals 6-10, usually 8, much longer than broad; plants with white spreading pubescence at base of petioles ..... *R. occidentalis*

Plants with inconspicuous yellow flowers

- Plants small, usually less than 2 dm tall, essentially glabrous; leaf segments blunt; achenes ca. 1 mm long, beaks not strongly recurved; alpine.. *R. pygmaeus*
- Plants larger, 3 to 8 dm tall, evidently pubescent; leaf segments acute; achenes 1.5-2 mm long, beaks strongly recurved and hooked; lowland.. *R. uncinatus*

Plants decumbent or sprawling, usually stoloniferous, aquatic or semiaquatic

- Petals white with yellow dot at base; leaves finely dissected into filiform segments ..... *R. aquatilis*

Petals yellow; leaves trilobed or entire

- Leaves trilobed ..... *R. flammula*
- Leaves linear to lanceolate, never lobed ..... *R. hyperboreus*

281. *Ranunculus acris L., Sp. Pl. 1: 554. 1753.

GRAHAM ISLAND: 4½ mi E of Masset, *CST21136A;* Masset Spit, *CST21242;* Queen Charlotte City, *CST21539, CST23024* (DAOM); Langara Island, *CST22532;* Image Pt., *CTS34691;* 1 mi W of Queen Charlotte City, *CTS34808.*

MORESBY ISLAND: Sandspit, *CST21113.*

Ranunculus acris is widely introduced along the Pacific coast. It is common in fields and waste places around Queen Charlotte City, Skidegate and Skidegate Village, in meadows at Sandspit, at the abandoned Haida village of Dadens on Langara Island, and in disturbed habitats in the vicinity of Haida and Masset. All collections belong to ssp. *acris* which is a native of Europe.

282. Ranunculus aquatilis L., Sp. Pl. 1: 556. 1753.
R. trichophyllus sensu Hult., Fl. Alaska & Yukon 4: 770. 1944.

GRAHAM ISLAND: Collinson Lake, *CT35537;* Yakoun Lake, *CT-36798.*

MORESBY ISLAND: Skidegate Lake, *CT23413, CT35274, CT35309;* Mosquito Lake, *CT23662.*

The disposition of the taxonomic entities in the *R. aquatilis – R. circinatus* group of the subgenus *Batrachium* is confusing from both the nomenclatural and biological viewpoints. This group is in need of a biosystematic treatment that combines study of mass collections, comparative environmental observation of plants under controlled growth conditions, and a thorough cytological review. The relationship between the Old and New World species is obscure, and in addition there seems to be little uniformity of opinion as to the taxa that occur in North America. Benson (1948, p. 241), who published a treatise of North American *Ranunculi,* points out that the distinction between *R. aquatilis* and *R. circinatus* Sibth. is not always clear, but he recognizes a total of eight infraspecific taxa for these two species. There seems little doubt that some varieties represent ecological forms and are of little taxonomic significance. Certainly the value of recognizing such taxa from a practical floristic standpoint is doubtful. We are referring all material from the Queen Charlotte Islands to *R. aquatilis* without any infraspecific designation as we are unable to analyze the taxonomic problem in this group on the basis of available material and data.

On the Islands *R. aquatilis* is restricted to fresh-water lakes. Flowering and fruiting collections were made during the months of July and August.

283. Ranunculus cooleyae Vasey & Rose, Contr. U.S. Nat. Herb. 1: 289. *pl.* 22. 1893.

GRAHAM ISLAND: Tan Mtn., *CST21616;* Shields Bay, *CT23347;* Jalun Lake, *CT35635;* Mt. Needham, June 18, 1961, *Foster & Bigg* (UBC).

MORESBY ISLAND: Takakia Lake, *CST23059, CT36308;* Mt. de la Touche, *CT23575;* Mosquito Mtn., *CT23734;* Mt. Russ, *CT36142.*

In 1944 Hultén (p. 749) reported the montane Pacific coast *R. cooleyae* from a number of localities in the Alaska panhandle. At the time, he was aware of only two other stations for this species, Hazelton in the Coast Mountains of northern British Columbia, and Mount Colonel Bob in the Olympic Mountains

of Washington. Hitchcock (*in* Hitchcock *et al.* 1964, p. 381) has recently reported an additional Washington station, Delcampo Peak in Snohomish County. The two Washington records about 450 miles to the south of Hazelton suggest a disjunct distribution, but recent collections by members of our institute (1954 to 1964) show that *R. cooleyae* has a continuous distribution in alpine regions along the mainland coast. On Vancouver Island it is restricted to high elevations in the mountains of Strathcona Provincial Park.

On the Charlottes this strikingly distinct species is restricted to the Queen Charlotte Ranges, where it usually occurs in rocky habitats such as ravines, cliff ledges and talus slopes. It is a species of late-snow areas at or near tree line and occurs from near Jalun Lake south to Mount de la Touche, Tasu Sound.

284. Ranunculus eschscholtzii Schlecht., Animadv. Ranunc. 2: 16. 1820.

MORESBY ISLAND: Takakia Lake, *CT36334;* Mt. Moresby, *CT36404;* Mosquito Mtn., *CT36461.*

The highly variable *R. eschscholtzii* is a member of the polymorphic sect. *Epirotes* (Prantl) L. Benson, that includes the closely related *R. nivalis* L., *R. pygmaeus* Wahlenb. and *R. verecundus* B. L. Robins. In *Flora of Alaska and Yukon,* Hultén (1944, p. 752) stated that *R. eschscholtzii* may form an almost continuous series with *R. nivalis* and *R. pygmaeus,* and that it is often difficult to find reliable distinguishing characters. This is true for the Alaska–Yukon populations, but to the south in British Columbia there are no signs of introgression between these species. A number of infraspecific taxa have been described for *R. eschscholtzii* but they are usually difficult to distinguish. The plants collected on the Queen Charlotte Islands have glabrous peduncles, flowers 1 to 1.5 cm in diameter, sepals with yellow hairs and achenes with straight beaks. These characters, combined with general basal leaf configuration, place our collections in the typical phase.

Plants of this species were collected only in the highest mountain mass on the Islands. At Takakia Lake two colonies were noted on stabilized talus fans in creek beds along the south side of the lake. A single colony was found on the rocky margin of a small tarn at approximately 2,400 ft on Mosquito Mountain and a few plants were noted along the margins of rocky runnels below the north face of Mount Moresby near its base.

285. Ranunculus flammula L., Sp. Pl. 1: 548. 1753.

Leaves filiform; rooting at all or nearly all nodes ..... var. *filiformis*
Leaves lanceolate, ovate, or oblanceolate; never rooting at all nodes
  Plants semiprostrate; leaves narrowly-lanceolate to ovate; rooting at most of the nodes ..... var. *ovalis*
  Plants upright; leaves larger than in var. *ovalis,* lanceolate, infrequently rooting above lowest node ..... var. *flammula*

285a. Ranunculus flammula L. var. **flammula**

GRAHAM ISLAND: 1½ mi S of Jungle Beach, *CST23459;* Yakoun Lake, *CT36786.*

MORESBY ISLAND: between Copper Bay and Skidegate Lake, *CST-21895, CT35258.*

285b. Ranunculus flammula L. var. **filiformis** (Michx.) Hook., Fl. Bor.-Amer. 1: 11. 1829.

R. reptans L., Sp. Pl. 1: 549. 1753; *R. flammula* var. *reptans* (L.) E. H. F. Meyer, Pl. Labradoricis 96. 1830.

GRAHAM ISLAND: Yakoun Lake, *CT36762.*

MORESBY ISLAND: Skidegate Lake, *CT23625, CT35265.*

285c. Ranunculus flammula L. var. **ovalis** (Bigel.) L. Benson, Bull. Torrey Club 69: 305. 1942.

R. reptans var. *ovalis* (Bigel.) T. & G., Fl. N. Amer. 1: 16. 1838.
R. flammula var. *unalaschensis* Besser ex Ledeb., Fl. Ross. 1: 32. 1842.

GRAHAM ISLAND: Mercer Lake, *CS21501;* 1½ and 3 mi W of Tow Hill, *CST22718, CST22741;* Yakoun River 16 mi S of Juskatla, *CT35498;* Jalun Lake, *CT35631;* 2 mi NW of Tlell, *CT35693;* near mouth of Oeanda River, *CT35900.*

MORESBY ISLAND: Upper Victoria Lake, *CT35766.*

Ranunculus flammula, represented in North America by three varieties, is extremely variable in habit; leaf shape, width and length; and flower size. In their extreme forms these varieties are most distinct, but they are intimately connected through a series of intergrading plants. We would normally treat these variants as subspecies but we do not feel that the necessary new combinations should be made at this time. Only after a thorough biosystematic study of the *R. flammula* complex can some decision be reached as to the taxonomic status of the various entities. The greatest variation probably occurs in the Pacific Northwest along the coast of British Columbia and northern Washington. The filiform or narrow, linear-leaved, creeping var. *filiformis* roots at all or almost all of its nodes and occurs throughout British Columbia, usually as a plant of sterile sandy soils along lake or river shores. The less repent var. *ovalis,* which has small lanceolate to ovate leaves and seldom roots at the majority of its nodes, is found in the southern and central part of the province from the Rocky Mountains to Vancouver Island. The variety, *flammula,* is essentially an upright plant with erect or ascending stems, large, lanceolate, oblanceolate or ovate leaves and only occasionally roots above the lowest node. This latter variety is restricted to meadows and marshes from Vancouver Island and the adjacent mainland north to the Queen Charlotte Islands. Although Benson (1948, p. 185) does not recognize var. *flammula* in western

North America, he considers some collections from the Pacific slope to be intergrades with this variety. All three varieties occur in the Queen Charlotte Islands. The filiform-leaved variety was found only on the gravel shorelines of Skidegate and Yakoun lakes; var. *ovalis* was collected in a number of meadows and marshes; and var. *flammula* was found in mucky pools near Jungle Beach, south of Copper Bay, and on a mucky beach along the east shore of Yakoun Lake. It is apparent that the variation in this species is at least partly ecological for the extremes occupy quite different habitats. The few colonies of var. *flammula* that we have seen on the west coast were growing in apparently highly nitrified mucky pools or along their margins, whereas the dimunitive var. *filiformis* was always found on sand or gravel.

286. Ranunculus hyperboreus Rottb., Skr. K. Danske Vid. Selsk. 10: 458. 1770.

GRAHAM ISLAND: about 2½ mi E of Tow Hill, *CST22742;* about 4 mi N of mouth of Oeanda River, *CT35871;* 1½ mi W of Yakan Pt., *CT36819.*

This species occurs in aquatic or damp terrestrial habitats and is tolerant of different or changing environments, such as places subject to flooding, drying out, and vernal pools. As a result of these varying conditions, habit and leaf form often vary and a number of segregates have been proposed for these variants. There seems, however, little evidence that these segregates have a genetic basis and most of them are probably best considered as ecophenotypes.

In 1957 *R. hyperboreus* was only found in a few mucky pools on a survey of the bogs and marshes between Tow Hill and Rose Spit. Two more stations were located in the same general area in 1964. A small colony was found in a marsh between old beach ridges east of Yakan and a few scattered colonies were located in stagnant pools in the spruce forest a few miles north of the mouth of the Oeanda River.

287. Ranunculus occidentalis Nutt. ssp. **occidentalis**

R. occidentalis Nutt. in Torr. & Gray, Fl. N. Amer. 1: 22. 1838.
R. occidentalis var. *brevistylis* Greene, Pittonia 3: 14. 1896.
R. occidentalis var. *hexasepalus* L. Benson, Bull. Torrey Club 68: 167. 1941; *R. hexasepalus* L. Benson, Amer. Midl. Nat. 40: 55. 1948.

GRAHAM ISLAND: between Queen Charlotte City and Skidegate Village, *CST20872;* 2½ mi S of Tlell, *CST20954;* Lepas Bay, *CST22599;* Dawson Inlet, *CST22933, CTS35135;* Langara Island, June 13, 1956, *Widdowson* (UBC); Skidegate, May 22, 1923, *Newcombe* (V), June 3, 1910, *Spreadborough* (CAN); Marble Island, June 16, 1961, *Foster & Bigg* (UBC).

MORESBY ISLAND: between Sandspit and Cape Chroustcheff, *CST-20989, CT35160;* Chaatl Narrows, *CST21782; S*andspit, *CST21859;* Copper Bay, *CST21906;* islet off Bolkus Islands, *CST22223;* Skedans Islands, *CST-22396;* Fairfax Inlet, *CT23620;* Limestone Island, *CTS34817;* South Low

Island, *CTS34842;* Low Island, *CTS35011;* Kootenay Inlet, *CT36027;* Canoe Channel, June 23, 1897, *Newcombe* (CAN).

Benson (1948), in his treatment of the North American *Ranunculi,* recognized three distinct infraspecific taxa for British Columbia in the *R. occidentalis* complex, and a new species *R. hexasepalus* based on material from the Queen Charlotte Islands. In a supplement published in 1954, he included the results of his examination of additional herbarium material, including the ones from the Plant Research Institute, and the information that he had garnered during field work in the Pacific Northwest including several trips to Alaska. As a result of these studies he cited a number of additional significant specimens to support the retention of four taxa for the British Columbia – Alaska region.

During the past 10 years, we have been able to accumulate an extensive series of collections of *Ranunculus* from British Columbia and portions of the Alaska coast and we have used these specimens as the basis for the appraisal of the *R. occidentalis* complex. We have carefully examined the *R. occidentalis* group in the Pacific Northwest from British Columbia northward and cannot differentiate more than two entities, *R. occidentalis* ssp. *occidentalis* and *R. occidentalis* ssp. *nelsonii* (DC.) Hult. We have found that the petal and sepal characteristics used by Benson to separate *R. hexasepalus* from *R. occidentalis* have no diagnostic value when a large series of specimens is examined. Observations have been made on 10 populations containing some 200 herbarium specimens from the Queen Charlotte Islands and we have compared these with those from related coastal areas. The number of sepals is not a good diagnostic character and the emarginate nature of petals is not constant. It is interesting to note in Benson's key to the section *Chrysanthe* (1948, p. 26, 27) that only two characters are used to separate *R. occidentalis* from *R. hexasepalus,* these being the number of sepals and the margination of the petals. However, in the table of characters for the infraspecific taxa of *R. occidentalis,* emarginate petals are a prime diagnostic character for separating the variety *brevistylis* Greene from both the typical variety and var. *nelsonii.* Clearly this petal character is not limited to *R. hexasepalus.* As we can find no appreciable and consistent difference between the Queen Charlotte Island plants and those from along the mainland and on Vancouver Island and the adjacent parts of Alaska, we are placing *R. hexasepalus* in the synonymy of ssp. *occidentalis.*

The statement by Benson in his discussion that *R. hexasepalus* is closely related to var. *nelsonii* is difficult to comprehend as the characters listed in the table — nectary scale, petal shape, length of achene beak, lobation of leaves, and distribution — indicate a closer relationship to the typical phase. The essentially Aleutian Islands segregate ssp. *nelsonii* is quite distinct and should be kept as a separate entity within the *R. occidentalis* complex.

We have tried to determine what constitutes *R. occidentalis* var. *brevistylis* in this northern coastal area and have been unable to distinguish any segment of the coastal population that differs from typical *R. occidentalis.* Benson has

separated *R. occidentalis* var. *brevistylis* from the typical variety essentially on the basis of two characters, pubescence and petal shape. All the remaining characters listed in his table (1948, p. 45, 46) overlap to such an extent that they cannot be considered to be of diagnostic value. Pubescence on stems and sepals characterizes the entire coastal population. Only a single plant specimen was examined that could be designated as glabrous. Most of the petals are elliptic or oblong but a few are obvate and they may be marginate or emarginate. As a result of our study we are including var. *brevistylis* in the synonymy of the typical subspecies of *R. occidentalis*.

Ranunculus occidentalis has a wide coastal distribution on the Queen Charlotte Islands. The variation in habit and degree of pubescence is associated with the habitat. Plants collected in grassy knolls or in grassy pockets along cliffs are shorter, more robust and pubescent, and have more conspicuous basal leaves than those growing in grassy swards along the upper parts of beaches. The number of petals varies from 6 to 12 and many flowers were noted that possessed eight. Petals may be marginate or emarginate on the same plant and even within the same flower and there seems to be little consistency with respect to this character. *Ranunculus occidentalis* forms very large and showy stands in the lush, grassy swards behind the beaches and is frequently associated with *Fritillaria kamtschaticum* (L.) Ker-Gawl.

288. Ranunculus orthorhynchus Hook., Fl. Bor.-Amer. 1: 21. 1829.

R. orthorhynchus var. *alaschensis* L. Benson, Bull. Torrey Club 68: 483. 1941; *R. orthorhynchus* ssp. *alaschensis* (L. Benson) Hult., Fl. Alaska & Yukon 4: 763. 1944.

GRAHAM ISLAND: 4½ mi E of Masset, *CST21136;* Yakan Pt., *CST-21324, CTS34765;* Yakoun River Delta, *CST21553, CT35464;* McClinton Bay, *CST21598;* Tlell, *CST22095, CTS34651;* Tow Hill, *CST22679;* Masset, *CST22801;* Long Inlet, *CT36001;* Juskatla, June 7, 1952, *Schmidt.*

Three entities of *R. orthorhynchus* are recognized by Benson (1948, p. 97, 98) in British Columbia and Alaska: the typical phase, var. *alaschensis,* and var. *platyphyllus* A. Gray. According to Benson the distribution of *R. orthorhynchus* var. *alaschensis,* is restricted to the extreme southern coast of Alaska and northwestern British Columbia. The other two taxa have a wide distribution in the Pacific Northwest and extend southward to Utah, Nevada, and California.

The apparent distinctions according to Hultén (1944, p. 763) and Benson (*loc. cit.*) between the typical phase and ssp. *alaschensis* are in the presence or absence of pubescence on the stems and sepals and in the length of the petioles. Microscopic examination of our northwestern British Columbia and southern Alaska material reveals that although the plants may appear to be glabrous in parts mentioned previously there is a tightly appressed pubescence on the stems and sepals. This is the condition found on the typical phase. The length of the petioles is variable and many of the plants of the northern population have long petioles, but this is not a consistent character when a

large series is examined. On the basis of the British Columbia and Alaska material examined we do not believe ssp. *alaschensis* should be recognized. The only other entity found in British Columbia is var. *platyphyllus,* which is apparently restricted to the interior, and to the central and southwestern coast regions of the province.

On the Queen Charlotte Islands *Ranunculus orthorhynchus* is always associated with wet habitats. It was collected in tidal meadows, along creek banks, in wet meadows behind beach ridges, and occasionally in the low-lying grassy zones behind the *Elymus mollis* zone along upper parts of beaches. It forms extensive colonies in some meadow habitats.

289. Ranunculus pygmaeus Wahlenb., Fl. Lapp. 157. 1812.

MORESBY ISLAND: Mosquito Mtn., *CT23701.*

Benson (1948, p. 134) in a treatment of *Ranunculus* for North America recognized two varieties in *R. pygmaeus.* He stated that var. *pygmaeus* has "basal leaf blades simple, 3-parted or -divided, the middle lobe entire, the lateral lobes 2-3-lobed; head of achenes ovoid or subglobose, 2.5-4 mm long, 2.5-3 mm in diameter," and that var. *langeanus* Nathorst has "basal leaf blade deeply divided or compound, . . . the middle division again 3-lobed, the lateral divisions 2- to 4-lobed or -cleft, . . . heads of fruits cylindroid, 5-7.5 mm long, 3-4.5 mm in diameter." The latter variety was described from Greenland, and Benson has included in its synonymy Fernald's var. *petiolatus,* which is reported from Mount Albert, Gaspé County, Quebec, and Glacier National Park in Montana.

Ranunculus pygmaeus is an extremely variable species in shape and cutting of its leaves, and in shape, length and diameter of the fruiting heads. The collection from the Queen Charlotte Islands includes some plants that have the lateral divisions of the leaf blades as many as 5-lobed and have fruiting heads which vary from globose to subcylindrical. Some of these plants could be placed in var. *langeanus,* others could be referred to var. *pygmaeus,* and still others are intermediate between the two varieties. Such variation may have prompted Hultén (1944, p. 766) to treat the occasionally robust plants of this species that occur along the Arctic coast as a distinct race, *R. pygmaeus* var. *sabinei* (R.Br.) Kurtz.

In accepting Kurtz's recognition of Robert Brown's *R. sabinei* at varietal rank, it is evident that Hultén had seen little material of this entity, which we, as well as other authors, believe should be maintained as a distinct species. We have collected atypical plants of *R. pygmaeus* in northern Yukon and agree that they do not exactly match any other collections of this species that we have seen. However, *Ranunculus* is a plastic genus and we prefer to regard these robust plants as morphological extremes of a highly polymorphic species. Hultén in his key to *Ranunculus* segregates *R. pygmaeus* from the closely related *R. eschsholtzii* Schlecht. and *R. verecundus* Robins. by the pubescent versus glabrous peduncles. This is not a reliable diagnostic character as the

peduncles of *R. pygmaeus* may be either glabrous or pubescent and often the two forms occur in the same collection. We have not seen enough material to offer an opinion as to whether var. *langeanus* should be maintained as a distinct taxon.

Ranunculus pygmaeus was only found on a steep, north-facing slope below the summit of Mosquito Mountain above Mosquito Lake. It was growing in gravel by a rivulet in a late-snow area with *Cardamine bellidifolia* L. and was past flower when collected on August 24 in 1957.

290. *Ranunculus repens L., Sp. Pl. 1: 554. 1753.

GRAHAM ISLAND: Masset, *CST21285;* near Skidegate Village, *CST-21713;* Image Pt., *CTS34692, CT35384.*

MORESBY ISLAND: Sandspit, *CST21109.*

Ranunculus repens is a variable species with a number of recognized forms. In addition to the typical phase, to which the collections cited belong, Benson (1948, p. 29) recognizes two other varieties in North America.

This species is introduced in many places in the Alaska panhandle and along the British Columbia coast. In the Queen Charlotte Islands it was noted in a ditch at Masset, in an abandoned gravel pit near Skidegate Village, in disturbed habitats at Image Point and along a grassy margin of a pond by the runways at Sandspit airport.

291. Ranunculus uncinatus D. Don in G. Don, Gen. Hist. 1: 35. 1831.
R. uncinatus var. *parviflorus* (Torr.) L. Benson, Amer. Midl. Nat. 39: 761. 1948.

GRAHAM ISLAND: Queen Charlotte City, *CST20906, CTS34798;* Tow Hill, *CST21191;* 3½ mi S of Masset, *CST21275;* Yakoun River Delta, *CST21556* (DAOM); McClinton Bay, *CST21670;* Langara Island, *CST22576;* Blackwater Creek, *T32;* Marie Lake, *T88;* Mamin River Delta, *T129, S3503;* Long Inlet, *CT36000;* Naden Harbour, *CT36851.*

MORESBY ISLAND: between Sandspit and Cape Chroustcheff, *CST-20979;* Sandspit, *CST21114* (DAOM), *CT35356;* about 3 mi S of mouth of Copper Creek, *CST21882;* East Copper Island, *CST22261;* Crescent Inlet, *CTS34980;* near Alliford Bay, *CT36259;* Lockeport, May 25, 1923, *Newcombe* (V).

Benson (1948, p. 68) in a treatment of *Ranunculus* for North America recognizes three varieties in *R. uncinatus:* var. *uncinatus,* var. *parviflorus* (Torr.) Benson (=*R. bongardii* Greene), and var. *earlei* (Greene) Pursh. Apparently var. *earlei* is restricted to Colorado and New Mexico while the other two varieties are essentially sympatric and range from the Aleutian Islands to Alaska to southern California and Arizona. Although var. *uncinatus* and var. *parviflorus* have the same general range, Benson has indicated that the former occurs mainly east of the Coast Mountains, whereas var. *parviflorus* is

the common element along the Pacific coast. We have examined a series of about 150 collections from British Columbia and Alaska and have come to the conclusion that only one entity should be recognized in this region. Most collections from west of the Coast and Cascades mountains have conspicuously hispid stems, leaves, petioles and achenes, but such plants are also widely distributed throughout interior British Columbia and extend to the Rocky Mountains of southern Alberta. Plants with glabrous achenes and sparsely hirsute to almost glabrous stems and petioles are found sporadically along the British Columbia – Alaska coast and in the interior parts of the province. There is no sharp line of demarcation between the types and unless diagnostic characters other than those indicated by Benson can be found we should consider the northern population to belong to a single taxon. This conclusion was also reached by Hultén (1944, p. 748) when he examined a much smaller body of material from Alaska.

In 1948 Benson stated that *R. uncinatus* was probably based on a collection from Mexico made by Sessé, Mociño, Castillo, and Moldonado. At a later date, as a result of new evidence based on Rickett's (1947) *The Royal Botanical Expedition to New Spain,* Benson pointed out (1954, p. 343) that Mociño had not only traveled in Mexico but had spent some time at Nootka. He states that "it is almost certain that his collection of the type of *R. uncinatus* was made in Alaska, probably at Nutka, and that the species does not occur in Mexico." Presumably the Nutka [Nootka] referred to is the settlement on the west coast of Vancouver Island, British Columbia. If this is the case, it is extremely unlikely that the Mociño collection, which is presumably composed of plants with glabrous achenes and with sparsely hirsute to glabrous stems and petioles, was made at Nootka, because all collections we have seen from the west coast of Vancouver Island are of the *parviflorus* type. Plants with the characters just mentioned are only found in the drier sections of eastern Vancouver Island.

Ranunculus uncinatus is widely distributed throughout the Queen Charlotte Islands. It is a lowland species found along stream banks in coniferous woods, in logged-over areas, on bluffs and cliffs by the sea, along the upper margins of beaches, and in other open habitats where the competition is not too severe and there is adequate moisture. There appears to be no correlation between the morphological characters exhibited and the habitat or locality. Most plants have hispid achenes and hirsute to hispid petioles and stems with brownish hairs, a few have almost glabrous stems and weakly hirsute petioles, and in one collection the fruiting heads are comprised of both glabrous and sparsely hispid achenes.

292. Thalictrum alpinum L., Sp. Pl. 1: 545. 1753.

MORESBY ISLAND: Mosquito Mtn., *CT23695, CT36448.*

Thalictrum alpinum is a widespread, but sporadically occurring, circumboreal species restricted in the Pacific Northwest to Yukon, Alaska, and north-

western British Columbia. A disjunct population occurs in the mountains of Wyoming, Colorado, Utah, and New Mexico, and a few collections have been made in high alpine regions of Nevada and California. The collections from the Queen Charlotte Islands represent the southernmost record of this species for the Pacific Northwest population. Two stations are recorded by Hultén (1944, p. 773) from the Alaska panhandle.

The single colony on the Charlottes was found on open alpine heath and comprised both flowering and fruiting plants.

Cruciferae

Pods with a prominent beak
- Leaves clasping stem ..... *Brassica*
- Leaves petiolate
  - Pods not jointed; stems with retrorse hairs..... *Sinapis*
  - Pods jointed; stems glabrous or with spreading hairs
    - Plants fleshy; petals purple; pedicels less than 1 cm long..... *Cakile*
    - Plants not fleshy; petals yellow; pedicels more than 1 cm long..... *Raphanus*

Pods lacking a beak
- Leaves entire or serrate
  - Pods much longer than broad
    - Plants with branched hairs
      - Plants perennial with basal rosette of leaves; pods usually less than 5 times as long as broad..... *Draba*
      - Plants annual without basal leaves; pods about 10 times as long as broad..... *Erysimum*
    - Plants glabrous or with simple hairs
      - Plants less than 1 dm high; basal leaves entire, ovate to broadly obovate, about 1 cm long. *Cardamine*
      - Plants more than 1 dm high; leaves not as in *Cardamine*
        - Cauline leaves clasping or if petiolate less than 1 cm broad..... *Arabis*
        - Cauline leaves petiolate, more than 1 cm broad..... *Hesperis*
  - Pods less than twice as long as broad
    - Pods strongly flattened contrary to septum
      - Pods obtriangular..... *Capsella*
      - Pods broadly elliptic to nearly circular
        - Mature pods about 1 cm long, broadly winged *Thlaspi*
        - Mature pods much smaller, wingless or slightly winged towards apex..... *Lepidium*

Pods inflated
Flowering scapes leafless, basal leaves grasslike. *Subularia*
Flowering scapes with clasping leaves, basal leaves absent or if present not as in *Subularia*
Styles lacking in fruit ..... *Cochlearia*
Styles prominent in fruit
Pods small, less than 3 mm long, almost globose ..... *Neslia*
Pods larger, more than 5 mm long, obovoid *Camelina*
Leaves irregularly deeply lobed or pinnatifid
Leaves pinnatifid ..... *Descurainia*
Leaves not pinnatifid
Petals white ..... *Cardamine*
Petals yellow
Stems and leaves pubescent ..... *Sisymbrium*
Stems and leaves essentially glabrous
Valves with distinct midribs; seeds over 1 mm long, in 1 row in each valve ... *Barbarea*
Valves lacking midribs; seeds less than 1 mm long, in 2 irregular rows in each valve ..... *Rorippa*

Arabis

Seeds distinctly in two rows; fruiting pedicels strictly appressed; pods terete ..... *A. glabra*
Seeds distinctly in one row; fruiting pedicels ascending or slightly divaricate; pods flat
Lower leaves with simple and forked hairs, oblanceolate to obovate-spatulate, never lyrate-pinnatifid ..... *A. hirsuta*
Lower leaves glabrous or with a few long stiff simple hairs, oblanceolate, at least some in every rosette lyrate-pinnatifid ..... *A. lyrata*

293. *Arabis glabra (L.) Bernh., Syst. Verz. Pfl. Erf. 195. 1800.

MORESBY ISLAND: near Alliford Bay, *CST21858;* Kaisun, *CT36526.*

Arabis glabra, which was only found in a few places in disturbed soil along the road from Alliford Bay to Sandspit, and at the abandoned Haida village of Kaisun, is not native to the Queen Charlotte Islands. According to Hopkins (1937, p. 106) this species is represented by two races in North America. Our collections belong to the northern ssp. *glabra*, which has pubescent stems with simple or bifurcate spreading hairs.

294. Arabis hirsuta (L.) Scop. ssp. **eschscholtziana** (Andrz.) Hult., Fl. Alaska & Yukon 5: 872. 1945.

A. eschscholtziana Andrz. in Ledeb., Fl. Altaica 3: 25. 1831.

A. hirsuta sensu Henry, Fl. South. B.C. 150. 1915, in part.

GRAHAM ISLAND: Haida Pt., *CST20882;* near Lawnhill, *CST20897;* Tow Hill, *CST21190, CTS34754;* Masset Spit, *CST21234;* Lepas Bay, *CST22627;* 1½ mi S of Jungle Beach, *CST23465;* Towustasin Hill, *CT35526;* Skidegate, June 22, 1897, July 1897, June 1901, and May 24, 1923, *Newcombe* (V); Masset, Sept. 8, 1902, *Newcombe* (V); Sisk, June 4, 1913, *Newcombe* (V); Tlell River, April 18, 1961, *Foster & Bigg* (UBC); islet off Claudet Island, May 17 and June 9, 1961, *Foster & Bigg* (UBC).

MORESBY ISLAND: Copper Bay, *CST20975, Foster & Joslin 37* (UBC); between Sandspit and Cape Chroustcheff, *CST20990;* Alliford Bay, *CST21063;* Sandspit, *CST21840;* Hotspring Island, *CST22299;* South Low Island, *CTS34833;* Tuft Islets, *CTS34875;* Kaisun, *CT36565;* Church Creek, June 16, 1952, *Pillsbury* (UBC); Limestone Island, June 9, 1903, *Newcombe* (V); Tasu Harbour, June 2, 1901, *Newcombe* (V).

Hopkins in a 1937 monographic treatment of North American *Arabis* recognized plants of the western hemisphere *A. hirsuta* complex as a distinct species, *A. pycnocarpa* Hopkins. Later Rollins (1941) discussed Hopkins' segregation of the North American taxa from the Eurasian and concluded "that phylogeny is best served by the maintenance of the principal natural entities as varieties rather than species" under *A. hirsuta.* He further emphasized (*loc. cit.*, p. 323) that each character separating *A. pycnocarpa* from *A. hirsuta* is variable and breaks down when tested on a large series of specimens. After discussing the variable nature of the Eurasian and North American populations, Rollins recognized *A. pycnocarpa* as a variety of *A. hirsuta* without describing the differences between it and the typical phase of Eurasia. It is certainly difficult to distinguish most of the Eurasian material from var. *pycnocarpa* and the possibility of recognizing this interior wide-ranging North American population as typical *A. hirsuta* should be considered in future investigations. In contrast to this perplexing problem, however, the distinct large-flowered Pacific coast population can be readily identified as a different entity, ssp. *eschscholtziana.* This subspecies extends inland in British Columbia along the Fraser and Skeena river drainage systems and occurs sporadically in the subalpine zones of Vancouver Island and adjacent mainland coastal mountains. A third entity, *A. hirsuta* var. *glabrata* T. & G., essentially restricted to the Cordilleran region, is recognized by most authors. Recent field studies conducted by members of our institute indicate that it apparently represents a more or less intermediate entity between the coastal ssp. *eschscholtziana* and the interior var. *pycnocarpa.* Its taxonomic status, then, must be only tentatively accepted.

On the Queen Charlotte Islands, ssp. *eschscholtziana* is strictly a lowland species found only at the coast on rock bluffs, cliffs, and along the upper margins of shingle and sand beaches. All the collections from the Islands have

white flowers with petals 6 to 10 mm long, narrow pods 1.0 to 1.7 mm wide and stem leaves that are usually conspicuously dentate. Although the stigma is sometimes weakly bifid, this is not a reliable morphological character for distinguishing this subspecies from the doubtful var. *glabrata*.

295. Arabis lyrata L. ssp. **kamchatica** (Fisch.) Hult., Fl. Aleut. Is. 202. 1937.
A. lyrata var. *kamchatica* Fisch. ex DC., Syst. Veg. 2: 231. 1821; *A. kamtschatica* Ledeb., Fl. Ross. 1: 121. 1841.
A. lyrata var. *occidentalis* S. Wats. ex B. L. Robinson, Syn. Fl. N. Amer. 1: 159. 1895.
A. lyrata var. *glabra* Hopkins, Rhodora 39: 93. 1937.

MORESBY ISLAND: between Cumshewa and Peel inlets, *CT35192;* Mt. Moresby, *CT36389*.

Arabis lyrata is a widely distributed species throughout most of eastern and western United States and Canada. The essentially western race, ssp. *kamchatica*, can be separated from the typical phase by its smaller flowers and less pubescent leaves. This subspecies occurs along the northeastern coast of Asia and from Alaska and Yukon south to Alberta, Montana, and northern Washington. It is reported by Fernald (1950, p. 725) to occur locally on the north shore of Lake Superior and in western New York State.

Arabis lyrata ssp. *kamchatica* was found in only two localities near the highest mountain mass on the Islands. It was found on well-drained rocky or gravelly soils near a small creek (*CT35192*) and on rock-talus borders of a north-facing runnel of Mount Moresby. At the latter site, plants of this species formed extensive fruiting colonies.

Barbarea

296. Barbarea orthoceras Ledeb., Ind. Sem. Hort. Dorpat. 2. 1824.
B. americana Rydb., Mem. N.Y. Bot. Gard. 1: 174. 1900.
B. orthoceras var. *dolichocarpa* Fernald, Rhodora 11: 140. 1909.
B. vulgaris sensu Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 42. 1921.

GRAHAM ISLAND: near Lawnhill, *CST20896;* Tow Hill, *CST21193*, *CTS34756;* Skidegate, *CST22456*, May 30, 1923, *Newcombe* (V), June 19, 1910, *Spreadborough* (CAN); Langara Island, *CST22565;* islet near Claudet Island, May 17, 1961, *Foster & Bigg* (UBC); Seal Island, Dawson Harbour, June 24, 1987, *Newcombe* (CAN).

MORESBY ISLAND: Sandspit, *CST21079*, *CST21104;* 3 mi S of Copper Bay, *CST21884;* East Copper Island, *CST22213;* Hotspring Island, *CST22298;* islets off Alliford Bay, *CST23233;* South Low Island, *CTS34847;* Tuft Islets, *CTS34878;* Takakia Lake, *CT36366;* Mt. Moresby, *CT36374;* head of Cumshewa Inlet, *CT36492*.

Barbarea orthoceras is a widespread and common element of the northern and eastern coasts of the Queen Charlotte Islands. It is an indigenous species

that readily invades disturbed habitats around populated areas. With the exception of the alpine and subalpine records from Takakia Lake and Mount Moresby, all collections are from lowland habitats.

Brassica

297. *Brassica campestris L., Sp. Pl. 2: 666. 1753.

MORESBY ISLAND: Sandspit, *CST23222*, *CT36051.*

Both collections of this species are from Sandspit. In 1957 a few plants were found in disturbed sandy-gravelly soil on the outskirts of the town along the road to Copper Bay, and in 1964 it was collected in an abandoned garden and beside the Islander Motel near the airport.

Cakile

Leaves pinnatifid ..... *C. maritima*
Leaves sinuate-dentate ..... *C. edentula*

298. Cakile edentula (Bigel.) Hook., Fl. Bor.-Amer. 1:59. 1830.

GRAHAM ISLAND: Tlell, *CST21810*, *Pillsbury 390* (DAO, UBC); Lepas Bay, *CST22612;* Tow Hill, *CST22691.*

MORESBY ISLAND: Sandspit, *CST21860*, *CST23213*, *CT35336*, *Foster & Joslin 31* (UBC); Hotspring Island, *CST22293;* Woodruff Bay, *CT36983.*

Cakile edentula in North America has been segregated into three varieties by Fernald (1922). He considered the Pacific coast population to be a distinct race, var. *californica* (Heller) Fernald, and subsequently Hultén (1945, p. 824) in his *Flora of Alaska and Yukon* also recognized this race on the basis of two collections from Alaska. Fernald carefully pointed out the essentially uniform nature of *C. edentula* and indicated that the western plants are "essentially identical" with the eastern ones. In discussing Heller's *C. californica*, Fernald suggested that the segregation of the western plant from the eastern one on the basis of fruit size is dubious because the amount of variation used for separating the two species can be found in any population of *C. edentula.* However, after carefully describing and discussing the morphological uniformity of *C. edentula*, Fernald then proceeded to establish three varieties based on a single "fundamental character," the articulating surface of the two joints of the pods. Recent studies in the Cruciferae by Mulligan (pers. comm.) in which plants have been grown under uniform conditions, indicate that the character of the articulating surface is variable within any one population and its diagnostic use in distinguishing intraspecific taxa is of doubtful value. A modern systematic study should be undertaken to determine whether races can be clearly defined within this wide-ranging uniform taxon. Until such a study is completed, we are referring all our Queen Charlotte Island and British Columbia material to *C. edentula.*

Cakile edentula is a common beach species found among driftwood and in the *Elymus mollis* zone on the northern and eastern coasts of the Islands.

299. *Cakile maritima Scop., Fl. Carn. ed. 2. 2: 35. 1772.

GRAHAM ISLAND: Tlell, *CST22097*, *CST23180*, *CT35430*.

This European species has apparently been introduced sporadically along both the Atlantic and Pacific coasts of North America. The records from the Queen Charlotte Islands represent the first time it has been reported north of Oregon on the Pacific coast. *Cakile maritima* is readily distinguished from *C. edentula* by its pinnate leaves and larger and more showy flowers.

This species was found in a number of places on the sand beaches at Tlell between the mouth of the Tlell River and Richardson's Ranch.

Camelina

300. *Camelina sativa (L.) Crantz, Stirp. Austr. 1: 18. 1762.

MORESBY ISLAND: Sandspit, *CST23223*.

Camelina sativa was found in 1957 growing with a number of other weeds in sandy soil along the roadside just south of Sandspit. No plants were found in the Sandspit area in the 1964 survey.

Capsella

301. *Capsella bursa-pastoris (L.) Medic., Pflanzengatt. 1: 85. 1792.

GRAHAM ISLAND: Masset Spit, *CST22648;* Masset, Sept. 8, 1902, *Newcombe* (V).

MORESBY ISLAND: Sandspit, *CST20997*, *CT35168;* Alliford Bay, *CST21056;* Gray Bay, *CT35237*.

Capsella bursa-pastoris was noted at Queen Charlotte City in addition to the five localities cited. It is a widely introduced species and probably occurs in all the other settled areas of Graham and Moresby islands.

Cardamine

All leaves simple ..... *C. bellidifolia*
At least cauline leaves compound
  Petals 8-14 mm long; leaves usually trifoliolate, rarely 5-pinnate; strongly rhizomatous ..... *C. angulata*
  Petals 2-6 mm long; leaves at least 5-pinnate, rarely trifoliolate; not rhizomatous (except in *C. occidentalis*)

Plants perennial, rhizomatous with small oblong white tubers..... *C. occidentalis*
Plants annual or winter biennial, never rhizomatous or tuber-bearing
Petals 4-6 mm long; plants with short slender rootstocks..... *C. umbellata*
Petals 2-3 mm long; plants with taproots or clusters of fibrous roots
Pods ca. 1.0 mm wide with 8-20 seeds; seeds 0.5 mm wide, 0.8 mm long, scarcely winged. *C. pensylvanica*
Pods ca. 1.0 mm wide with 8-20 seeds; seeds 0.8 mm wide, 1.0 mm long, winged..... *C. oligosperma*

302. Cardamine angulata Hook., Fl. Bor.-Amer. 1: 44. 1829.

GRAHAM ISLAND: near Skidegate Village, *CST21434;* Lepas Bay, *CST22590;* Mamin River Delta, *T113;* Image Pt., *CTS34681;* Yakoun River bridge about 4½ mi S of Port Clements, *CTS35030;* Yakoun River 16 mi S of Juskatla, *CT35497;* Juskatla, May 30 and June 17, 1952, *Schmidt;* Dawson Harbour, June 24, 1897, *Newcombe* (CAN), June 26, 1897, *Newcombe* (V).

MORESBY ISLAND: Sandspit, *CST21091;* Cumshewa, April 26, 1901, *Newcombe* (V); Lockeport, June 1, 1923, *Newcombe* (V).

Cardamine angulata is a widely distributed lowland species on the Queen Charlotte Islands, but elsewhere along the British Columbia and Alaska coast it is relatively rare. It seems to prefer the rich alluvial moist soils that commonly occur along streams in mature coniferous woods. Most populations sampled had many flowering individuals, but later revisitation to such populations revealed that no seeds had set in any of the many plants examined. There seems to be no evidence from our two summer surveys on the Islands that *C. angulata* reproduces sexually. Field examination reveals that this species possesses an aggressive, rhizomatous-bulbiferous method of reproduction.

303. Cardamine bellidifolia L., Sp. Pl. 2: 654. 1753.

MORESBY ISLAND: Mosquito Mtn., *CT23700, CT36447.*

This species was only collected on one of the highest mountains of the Islands where a few plants were found on a north-facing talus slope below one of the higher peaks. It is probably more widespread in the mountainous regions than is indicated by the two collections.

304. Cardamine occidentalis (S. Wats.) Howell, Fl. NW. Amer. 50. 1897.
C. pratensis var. *occidentalis* S. Wats. in B. L. Robinson, Syn. Fl. N. Amer. 1: 158. 1895.
C. neglecta Greene, Pittonia 3: 154. 1897.

GRAHAM ISLAND: Mamin River Delta, *T131;* Jalun Lake, *CT35630.*

MORESBY ISLAND: Skidegate Lake, *CT35271.*

Cardamine occidentalis is probably the most poorly represented western North American member of the genus *Cardamine* in herbaria. It is frequently overlooked in field surveys as it closely resembles *C. umbellata* Greene, but, as Greene indicates in his discussion (1897, p. 154) of the two species, *C. neglecta* (= *C. occidentalis*) can be readily distinguished from *C. umbellata* by the presence of oblong upright tubers at the base of the stem.

On the Queen Charlotte Islands *C. occidentalis* is more widely distributed than is indicated by the records. It is restricted to low, wet, and usually mucky depressions near margins of lakes or rivers. A number of specimens were collected on the wet sandy banks of the Mamin River near Juskatla, but these collections undoubtedly represent introductions from upriver colonies that were deposited in the delta region during spring floods. The collections from the Charlottes are near the northern limit for this species.

305. Cardamine oligosperma Nutt. in T. & G., Fl. N. Amer. 1: 85. 1838.

GRAHAM ISLAND: 2½ mi S of Tlell, *CST20895;* near Lawnhill, *CST20903;* Tow Hill, *CTS34764;* Towustasin Hill, *CT35531;* near Millar Creek, May 18, 1961, *Foster & Bigg* (UBC).

MORESBY ISLAND: Alliford Bay, *CST21073;* Sandspit *CST21090B, CT35354;* East Copper Island, *CST22219A;* Limestone Island, *CST22409,* May 27, 1923, *Newcombe* (V); Skedans, April 25, 1901, *Newcombe* (V); Cumshewa, April 26, 1901, *Newcombe* (V).

The collections from the Queen Charlotte Islands represent the northernmost stations of this small annual along the Pacific coast. To the south, it occurs west of the Cascade Mountains and extends down the coast to Los Angeles County, California.

Cardamine oligosperma is restricted to the upper beaches or rocky headlands or cliffs along the dry eastern coasts of Moresby and Graham islands. The only exception to this distribution is a single collection from Towustasin Hill. Its occurrence with other eastern coast species at this unusual site is discussed in the Introduction. *Cardamine oligosperma* occurs sympatrically with *C. umbellata,* but it prefers a less mesic habitat.

306. Cardamine pensylvanica Muhl. ex Willd., Sp. Pl. ed. 4. 3: 486. 1800.

GRAHAM ISLAND: Langara Island, *CST22580, Guiget* (V); Honna River, *CT35407;* Yakoun River bridge 4½ mi S of Port Clements, *CT35583.*

MORESBY ISLAND: Skidegate Lake, *CST21015;* head of Cumshewa Inlet, *CST21046;* Sandspit, *CST21090A;* Lockeport, June 1, 1923, *Newcombe* (V).

Cardamine pensylvanica is a widespread species in North America. On the Queen Charlotte Islands it was found in moist, mucky depressions in spruce-hemlock woods, wet runnels below sea cliffs, and in partially shaded logged-over areas.

307. Cardamine umbellata Greene, Pittonia 3: 154. 1897.
C. kamtschatica O. E. Schulz, Bot. Jahrb. 32: 470. 1903.

GRAHAM ISLAND: Masset, *CST20948;* Tow Hill, *CST21182, CTS34755;* Empire Anchorage, *CS21450;* Tlell, *CTS34657;* Masset Spit, *CTS34730;* Jalun Lake, *CT35672;* Long Inlet, *CT35966;* Naden Harbour, *CT36840;* Mamin River 7 mi S of Juskatla, May 30 and June 4, 1952, *Schmidt;* Langara Island, *Widdowson* (UBC); Skidegate, June 30, 1901, *Newcombe* (V); Sisk, June 1913, *Newcombe* (V).

MORESBY ISLAND: Alliford Bay, *CST21075;* East Copper Island, *CST22219;* islet off Bolkus Islands, *CST22226;* Takakia Lake, *CST23112, CT36297;* Crescent Inlet, *CTS34983;* Horn Rock, Aug. 9, 1957, *Mills.*

Cardamine umbellata is a widespread and phenotypically variable species of the northwest Pacific coast region. Throughout most of its range it is a conspicuous, spring-flowering species. The general habit of the plant often changes markedly as it matures and may be further modified by the particular environment in which it grows. For example, plants with compact, somewhat succulent rosettes are found on exposed rocky headlands on the small islands off the east coast of Moresby Island, whereas sprawling to tall upright plants occur in the interior along the margins of woods. Mr. G. A. Mulligan of our institute has pointed out that there is a tendency toward leaf angularity and a more strict umbellate inflorescence in the northern population along the Pacific coast, but these tendencies are not seen in the more southern coastal and inland populations.

Cardamine umbellata is a common element of the lowland flora of the Islands. It is apparently rare at higher elevations but was collected at the alpine Takakia Lake site where we camped in late July and early August during both our 1957 and 1964 surveys.

Cochlearia

308. Cochlearia officinalis L. ssp. **oblongifolia** (DC.) Hult., Fl. Kamtch. 2: 147. 1928.

GRAHAM ISLAND: mouth of Sangan River, *CST21149,* May 29, 1951, *Cowan* (UBC); Masset Spit, *CST21237, CTS34727;* Tlell, *CST21374, CTS34631A,* July 25, 1925, *W. A. Newcombe* (V); Queen Charlotte City, *CST22474;* Langara Island, *CST22568;* Dawson Inlet, *CST22841; CTS35141;* Juskatla, *S3514;* Naden Harbour, *CT36873;* small islet near Claudet Island, June 9, 1961, *Foster & Bigg* (DAO, UBC); Skidegate, July 8, 1910, *Spreadborough* (CAN); Dawson Harbour, June 24, 1897, *Newcombe* (CAN); Skidegate Channel, June 1897 and May 26, 1909, *Newcombe* (V).

MORESBY ISLAND: Alliford Bay, *CST21076;* Chaatl Narrows, *CST21742;* Copper Bay, *CST21901;* head of Cumshewa Inlet, *CST21987, CT35230;* Bigsby Inlet, *CST22156;* islet off Bolkus Islands, *CST22231;* Hotspring Island, *CST22281;* mouth of Deena River, *CT23799;* Tuft Islets, *CTS34867;* Kootenay Inlet, *CT36220;* Gowdas Islands, *CT36576;* Gowgaia Bay, June 1901, *Newcombe* (V); Lockeport, *Newcombe* (V); Kaisun, June 1901, *Newcombe* (V).

Plants from the northwest Pacific coast have orbicular-shaped pods and are recognized by Hultén (1945, p. 817) as belonging to a different subspecies than plants with oblong pods which are found in Arctic and Bering Sea populations. We fully concur with his recognition of but a single species and we include the material from the Queen Charlotte Islands in the more southern ssp. *oblongifolia.*

This species is one of the most common coastal elements of the Queen Charlotte Islands.

Descurainia

309. *Descurainia sophia (L.) Webb ex Prantl in Engler & Prantl, Nat. Pfl. 3: 192. 1892.

MORESBY ISLAND: Sandspit, *CST23221, CT36036.*

A few plants of *D. sophia* were found in sandy-gravelly soil along the roadside just south of Sandspit. This species was growing in a sparsely vegetated area back from the beach dunes with such weedy species as *Thlaspi arvense* L., *Erysimum cheiranthoides* L., *Polygonum convolvulus* L., *Camelina sativa* (L.) Crantz, *Lepidium densiflorum* Schrad., and *Brassica campestris* L.

Draba

Plants robust with thick taproots; leaves succulent, oblong-spatulate, up to 30 cm long; petals yellow; pods flat, 18-22 mm long; seeds 1.5 mm long, black; maritime ..... *D. hyperborea*

Plants small with slender taproots; leaves not succulent, oblanceolate to obovate, up to 12 mm long; petals white, pods twisted, about 10 mm long; seeds 1 mm long, brown; montane ..... *D. lonchocarpa*

310. Draba hyperborea (L.) Desv., J. Bot. Appl. 3: 178. 1814. **Figures 131 and 132.**

Alyssum hyperboreum L., Sp. Pl. 2: 651. 1753.

Cochlearia siliquosa Schlecht. in DC., Reg. Veg. Syst. Nat. 2: 369. 1821; *Nesodraba siliquosa* (Schlecht.) Greene, Pittonia 3: 253. 1897.

Draba grandis Langsd. in DC., *op. cit.*, 355; *N. grandis* (Langsd.) Greene, *l.c.*

N. megalocarpa Greene, *l.c.*

GRAHAM ISLAND: Langara Island, *CST22567;* Lepas Bay, *CST22594;*



Figures 131–132. *Draba hyperborea* (L.) Desv. 131. Habit (× ½). 132. Mature pod (× 2½).

Dawson Harbour, June 26, 1897, *Newcombe* (V–type of *N. megalocarpa*); Pillar Bay, June 13, 1913, *Newcombe* (CAN); Pillar Pt., June 21, 1913, *Newcombe* (V).

MORESBY ISLAND: islet off Bolkus Islands, *CST22222;* Skedans Islands, *CST22384;* Gray Bay, *CST23426;* Tuft Islets, *CTS34866*, July 25, 1961, *Foster & Joslin* (UBC); Gowdas Islands, *CT36570;* Egg Islands, Tasu, June 1901, *Newcombe* (V); Tasu Harbour, June 2, 1902, *Newcombe* (V); Skedans, Sept. 14, 1902, *Newcombe* (V).

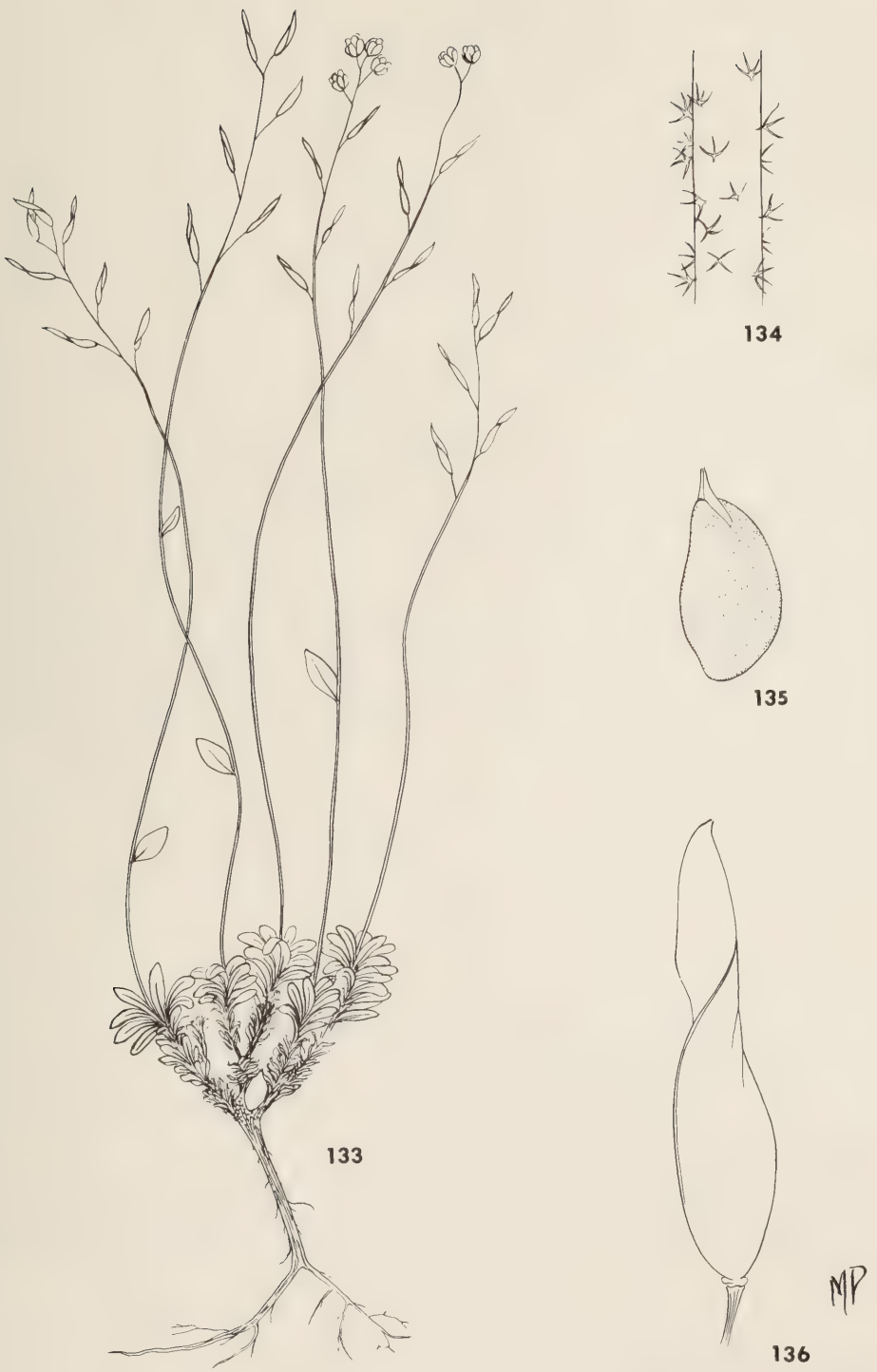
In 1897 Greene placed Schlechtendal's *Cochlearia siliquosa* and Langsdorff's *Draba grandis*, both based on collections from Alaska, in a new genus *Nesodraba*. Greene also described at this time a new species, *N. megalocarpa*, typified by a Newcombe collection from Dawson Harbour in the Queen Charlotte Islands (cited under GRAHAM ISLAND). In our opinion there is no justification for the establishment of a new genus. After examining a series of collections we prefer to join recent authors in referring all plants in this complex to *Draba*, recognizing only a single species, *D. hyperborea*. Hitchcock (1941, p. 93) aptly stated the case when he said, "however, since these differences [succulence and huge silicles] are more properly defined as differences of degree rather than of kind (or of 'quantity rather than quality'), I am treating it as a member of the genus *Draba*." This distinctive Pacific-coast *Draba* ranges from northern Vancouver Island to Alaska and westward through the Aleutian Chain to Kamchatka and the Kurile Islands. Hultén (1945, p. 856) recognized the plant from the Kuriles as a distinct race, ssp. *platytricha*, characterized by leaves with simple or slightly forked hairs. North American plants have a pubescence of essentially 2- to 3-forked hairs.

Draba hyperborea is an extremely variable species in height and size, and shape of the leaves and pods. The variability may be due to habitat. It is found at the seacoast in highly nitrified soils on exposed bird-nesting islets. *Draba hyperborea* becomes well established and flourishes in this ecological niche, where there is little competition from other maritime plants. It is occasionally found on rocky headlands and cliffs at the coast.

This species is widely distributed along both the east and west coasts of the Charlottes, but is absent from eastern Graham Island and a considerable stretch of its north coast, where there are no suitable habitats. Particularly robust plants were found in protected rock niches on the Tuft Islets and Gowdas Islands, where some individuals have taproots up to 4 cm in diameter. *Draba hyperborea* flowers very early in the season but the fruiting stalks persist long after the seeds have been disseminated. This species is probably distributed along the coast by the glaucous-winged gull, which is the only sea bird that frequents the small rocky offshore islets in large numbers.

311. Draba lonchocarpa Rydb. ssp. **kamtschatica** (Ledeb.) Calder & Taylor, Can. J. Bot. 43: 1393. 1965. **Figures 133–136.**

D. frigida var. *kamtschatica* Lebed., Fl. Ross. 1: 150. 1842; *D. kamtschatica* (Ledeb.) N. Busch, Bull. Acad. Sci. Russ. VI. 12: 1639. 1918; *D. nivalis* var. *kamtschatica* (Ledeb.) Pohle, Fedde Repert. 32: 90. 1925.



Figures 133–136. *Draba lonchocarpa* Rydb. ssp. *kamtschatica* (Ledeb.) Calder & Taylor. 133. Habit (× ½). 134. Pubescence on stem (× 30). 135. Seed (× 30). 136. Pod (× 7½).

MORESBY ISLAND: Newcombe Peak, *CST22001;* Takakia Lake, *CT36341;* Mt. Moresby, *CT36382;* Mosquito Mtn., *CT36474.*

Subspecies *kamtschatica* is the coastal race of the Cordilleran *D. lonchocarpa* Rydb. This species has been considered as a segregate of the circumboreal *D. nivalis* Liljebl., but Hitchcock, in a recent (1964) treatment of the genus for the Pacific Northwest, considers the western Cordilleran plant with twisted elongate pods, glabrous scapes, and 1 to 3 stem leaves to be distinct from *D. nivalis* and accords it the specific rank originally proposed by Rydberg (1900, p. 181). Subspecies *kamtschatica* extends from Mount Arrowsmith on Vancouver Island to Kamchatka in Asia. This race is distinguished from the inland typical phase by the stellate pubescence on the scapes and the loosely caespitose habit of the basal rosette. This subspecies has clear affinities with both *D. lonchocarpa* and *D. nivalis*, but it is best treated as part of the North American taxon when the nature of the pod and general habit of the plant are considered.

This subspecies is poorly represented in most herbaria and this is undoubtedly due to the local occurrence of ssp. *kamtschatica* in high alpine areas of which only a few have been surveyed along the coast. The four collections cited are from the highest mountain area on the Queen Charlotte Islands. They are quite uniform and can be described as follows: loosely caespitose perennials; leaves oblanceolate to obovate, often toothed, 5 to 12 mm long, stellate-pubescent with occasional marginal trichomes; scapes up to 15 cm long, leafless or with 1- to 3-toothed leaves, finely stellate-pubescent; racemes 3- to 10-flowered; pedicels shorter than the fruits; petals white, 1.5 to 2.5 mm long; pods linear to narrowly oblong, conspicuously twisted, glabrous, about 1 cm long when mature; seeds 10 to 20, about 1 mm long. Plants similar to those from the Islands have been found near Smithers and Skeena River Crossing on the adjacent mainland of British Columbia.

Draba lonchocarpa ssp. *kamtschatica* was only found in rock crevices or along the margins of rocky runnels from 1,000 to 2,700 ft in the mountain mass near the head of Cumshewa Inlet on Moresby Island. It is one of the rarest alpine species on the Island.

Erysimum

312. *Erysimum cheiranthoides L., Sp. Pl. 2: 661. 1753.

MORESBY ISLAND: Sandspit, *CST23225*, *CT36026.*

In 1957 a few plants of *E. cheiranthoides* were found in sandy soil on the outskirts of Sandspit on the road to Copper Bay. This species was noted a number of times in disturbed habitats in the townsite in 1964.

Hesperis

313. *Hesperis matronalis L., Sp. Pl. 2: 663. 1753.

MORESBY ISLAND: near Alliford Bay, *CST21854.*

A single plant of *H. matronalis* was found with a number of other adventives on a gravel-shingle beach a mile or so northeast of Alliford Bay. This species is a common garden escape in southern British Columbia but is rare along the coast to the north.

Lepidium

Fruit covered with small scale-like vesicles; cauline leaves many, sagittate, clasping ..... *L. campestre*
Fruit glabrous; cauline leaves few, oblanceolate, not clasping ..... *L. densiflorum*

314. *Lepidium campestre (L.) R. Br. in Ait. f., Hort. Kew. 4: 88. 1812.

MORESBY ISLAND: Sandspit, *CST21111*, *CT35343*, *CT36012*.

This species was noted only in the vicinity of Sandspit. The only large colony was found along the upper limits of the sand beach just north of the airport runway.

315. *Lepidium densiflorum Schrad., Ind. Sem. Horti. Götting. 4. 1832.

MORESBY ISLAND: Sandspit, *CST23222A*.

A single plant of this species was found along the sandy-gravelly roadside just south of Sandspit. According to Mulligan (1961), the specimen belongs to ssp. *densiflorum*. This variety is native at least to the southern part of the Prairie Provinces and possibly southern Ontario. The British Columbia populations, especially in the lower Fraser River valley and on southern Vancouver Island, are probably introduced.

Neslia

316. *Neslia paniculata (L.) Desv., J. Bot. Appl. 3: 162. 1814.

MORESBY ISLAND: Sandspit, *CT36018*, *Foster & Joslin 32* (DAO, UBC).

Neslia is a rare weed on the Islands that was found only in disturbed habitats in the town of Sandspit. It was locally abundant in the garden area of an abandoned home near the beach on the west side of town.

Raphanus

317. *Raphanus raphanistrum L., Sp. Pl. 2: 669. 1753.

MORESBY ISLAND: Sandspit, *Foster & Joslin 28* (DAO, UBC).

We did not find *R. raphanistrum* during either the 1957 or 1964 surveys. The only record is the collection by Foster and Joslin from Sandspit, an area where many other adventives have been found.

Rorippa

318. *Rorippa islandica (Oeder) Borbás, Balaton Tav. Part 2:392. 1900.
Sisymbrium islandicum Oeder ex Murray, Nov. Comm. Soc. Reg. Gött. 3: 81. 1773.
Radicula palustris (L.) Moench, Meth. 263. 1794.

GRAHAM ISLAND: 2½ mi S of Tlell, *CT35945*, *CT36876*.

Rorippa islandica is widely distributed throughout most of the Cordilleran region of North America. It is a species that characteristically grows in moist or wet seepage areas and forms dense stands in disturbed wet habitats. On the Queen Charlotte Islands *Rorippa* was collected at a single station, a partially water-filled abandoned gravel pit immediately behind the coast. It was growing with a number of other introduced weeds and is itself obviously an introduction on the Islands.

Sinapis

319. *Sinapis arvensis L., Sp. Pl. 2: 668. 1753.
Brassica kaber var. *pinnatifida* (Stokes) Wheeler, Rhodora 40: 308. 1938.
B. kaber var. *schkuhriana* (Reichenb.) Wheeler, *l.c.*

MORESBY ISLAND: Sandspit, *CST23217*, *CT36014*.

In 1957 a number of plants of *S. arvensis* were found in sandy soil back of the low beach ridges along the road to Copper Bay on the outskirts of Sandspit. Further colonies were noted in 1964 in an abandoned garden and along the upper limits of the beaches near the airport.

Sisymbrium

Pods straight, appressed to inflorescence axis, less than 2 cm long ..... *S. officinale*
Pods not straight or appressed to inflorescence axis, more than 4 cm long ..... *S. altissimum*

320. *Sisymbrium altissimum L., Sp. Pl. 2: 659. 1753.

MORESBY ISLAND: Sandspit, *CT35344*, *CT36043*.

This species and *Lepidium campestre* (L.) R. Br. formed large colonies in a disturbed gravel depression at the northwest end of the runway at Sandspit. Only infrequent isolated plants were noted elsewhere and it is probably an ephemeral ruderal that is introduced periodically from the mainland.

321. *Sisymbrium officinale (L.) Scop., Fl. Carn. ed. 2. 2: 26. 1772.

GRAHAM ISLAND: Queen Charlotte City, *CT35912*.

Sisymbrium officinale, a rare species on the Islands, is a common weed throughout southern British Columbia. Plants from the Queen Charlottes have glabrous pods and could be referred to var. *leiocarpum* DC.

Subularia

322. Subularia aquatica L. ssp. **americana** Mulligan & Calder, Rhodora 66: 132. 1964.

MORESBY ISLAND: Skidegate Lake, *CT23417*, *CT36729;* Mosquito Lake, *CT23653*, *CT36718*.

The differences between the North American and Eurasian *S. aquatica* have been discussed by Mulligan and Calder (1964). Although some collections from western North America tend towards ssp. *aquatica*, all plants from the Queen Charlotte Islands belong to typical ssp. *americana*.

Subularia aquatica is locally common in shallow water in a protected, gravel-margined bay near the outlet of Skidegate Lake and a few colonies were found along the muddy shoreline near the bridge that spans the lake. It also occurs in shallow water along gravel beaches at the east end and along the north shore of nearby Mosquito Lake. This species apparently does not tolerate the stagnant, acidic waters of the many ponds and small lakes that are found in the lowland bogs of eastern Graham and northeastern Moresby islands. As there are only a few large lakes with shallow, gravelly, or muddy shorelines it is not surprising that *Subularia* is of local distribution on the Islands.

Thlaspi

323. *Thlaspi arvense L., Sp. Pl. 1: 646. 1753.

MORESBY ISLAND: Sandspit, *CST21861*, *CST23224*, *CT35167*.

Thlaspi arvense was only noted in the vicinity of Sandspit. A few plants were found along the upper limits of the beach just east of the airport and a localized colony was observed about a mile to the south of the townsite along the road to Copper Bay. We did not see this species near any of the other settlements.

Droseraceae

Drosera

324. Drosera rotundifolia L., Sp. Pl. 1: 281. 1753.

GRAHAM ISLAND: near Tow Hill, *CST22699;* Newton Pt., *CST22964;* Dawson Inlet, *CTS35104;* 8 mi NW of Tlell, *CT35695;* Yakoun Lake, *CT36745*, Aug. 1895, *Newcombe* (V); Juskatla, July 16, 1952, *Schmidt;* MacIntosh Meadows, Aug. 27, 1961, *Foster & Bigg* (UBC).

MORESBY ISLAND: Red Mud Marsh, *CST23188;* between Gray and Sheldens bays, *CST23438;* Skidegate Lake, *CT23629;* between Aero and Moresby logging camps, *CT35293;* Upper Victoria Lake, *CT35770;* Kootenay Inlet *CT36135;* Mt. Moresby, July 13, 1961, *Foster & Bigg* (UBC).

Drosera rotundifolia is a common element of the lowland sphagnum bogs and other boggy habitats throughout the Islands, but it occasionally occurs on subalpine slopes in the Queen Charlotte Ranges. All populations flowered abundantly. This species is the only member of the genus found on the Islands, although *D. anglica* Huds. occurs in the nearby Alaska panhandle and on Vancouver Island.

Crassulaceae

Sedum

Flowers polygamous; leaves flat, often serrate; rootstocks woody; carpels erect in fruit..... *S. roseum*
Flowers perfect; leaves terete; rootstocks slender branching; carpels divergent in fruit..... *S. divergens*

325. Sedum divergens S. Wats., Proc. Amer. Acad. 17: 372. 1882.

GRAHAM ISLAND: between Skidegate and Skidegate Village, *CST21407;* Image Pt., *CTS34683, CT35380.*

MORESBY ISLAND: head of Cumshewa Inlet, *CST21985;* Hotspring Island, *CST22288;* Skedans Islands, *CST22390;* Limestone Island, *CST22406;* Gray Bay, *CST23424;* South Low Island, *CTS35007;* Skedans, April 29, 1901, *Newcombe* (V); Cumshewa, June 1901, *Newcombe* (V); Burnaby Island, June 14, 1913, *Newcombe* (V).

On the Queen Charlotte Islands *S. divergens* is restricted to dry rocky headlands and bluffs along the shores of southeastern Graham and eastern Moresby islands. The lowland occurrence of this species on the Charlottes is in marked contrast to its presence in subalpine habitats in the southern part of its range, where it is restricted to the Cascade and Coast mountains of British Columbia, Washington, and adjacent Oregon. The records from the Islands represent the northern limit of *S. divergens* along the northwest Pacific coast.

326. Sedum roseum (L.) Scop., Fl. Carn. ed. 2. 1: 326. 1772.
Rhodiola alaskana sensu Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 45. 1921.
Sedum frigidum sensu Carter & Newcombe, *op. cit.* 46.

GRAHAM ISLAND: Empire Anchorage, *CS21526;* Lepas Bay, *CST22595;* between Ells and Mercer pts., *CST22892;* Langara Island, June 13, 1956, *Widdowson* (UBC), May 16, 1952, *Beebe* (V); Marble Island, June 16, 1961, *Foster & Bigg* (UBC); Dawson Harbour, June 24, 1897, *Newcombe* (CAN);

Yakoun Lake, Aug. 1895, *Newcombe* (V); Hippa Island, June 6, 1913, *Newcombe* (V); Skidegate, June 1897, *Newcombe* (V).

MORESBY ISLAND: Newcombe Peak, *CST22037;* East Copper Island, *CST22217;* Mt. de la Touche, *CT23584;* Takakia Lake, *CT36304;* Mt. Moresby, *CT36380;* Kaisun, *CT36550;* Sunday Inlet, *CT36640;* Gowdas Islands, *CT36643.*

Plants of *S. roseum* from the Queen Charlotte Islands comprise a uniform population, which on the basis of general leaf configuration, habit, and particularly flower color, must be referred to ssp. *roseum* of Europe, eastern North America, and Asia. Typical *S. roseum* is readily distinguished from the western North American red-flowered ssp. *integrifolium* (Raf.) Hult. by the presence of yellowish-green petals and filaments and yellow anthers. Hultén (1945, p. 897, 898) has discussed the distribution of the two subspecies in Alaska and adjacent Asian and Canadian regions. On the basis of a single record from Nome on the Bering Sea, he stated that ssp. *roseum* occurs in westernmost Alaska. We have seen a specimen from Kodiak Island that belongs here (*Trelease 4015*). Undoubtedly ssp. *roseum* occurs between these two stations and the Queen Charlotte Islands, but we have seen no specimens. All other mainland British Columbia, Yukon, and Alaska collections belong to ssp. *integrifolium.*

Sedum roseum occurs sporadically from sea level to mountain summits in the Queen Charlotte Ranges. It never forms a conspicuous element of the vegetation, but may be abundant on rock stacks and bluffs along the west coasts.

Saxifragaceae

Shrubs ..... *Ribes*
Herbs
  Stamens 5, alternating with 5 staminodia; leaves reniform ..... *Parnassia*
  Stamens 3, 5, or 10; staminodia absent; leaves not reniform
    Petals fringed or laciniately lobed
      Stamens 5; petals green; basal leaf petioles sparingly pubescent ..... *Mitella*
      Stamens 10; petals cream-colored, often turning pink in age; basal leaf petioles copiously pubescent ..... *Tellima*
    Petals not fringed or laciniately lobed
      Stamens 3; flowers reddish brown ..... *Tolmiea*
      Stamens 5 or 10; flowers not reddish brown
        Stamens 5 ..... *Heuchera*
        Stamens 10
          Capsule valves unequal; basal leaves trifoliolate or simple, 3–5-lobed and doubly serrate, more than 3 cm wide ..... *Tiarella*

Capsule valves equal; basal leaves simple, never doubly serrate, if lobed less than than 3 cm wide
Leaves glabrous, leathery; plants strongly rhizomatous..... *Leptarrhena*
Leaves glabrous or pubescent, not leathery; plants never rhizomatous, but some species with several-branched caudices. *Saxifraga*

HEUCHERA

Panicles spikelike; scapes and petioles villous with spreading hairs..... *H. chlorantha*
Panicles open; scapes and petioles glabrous to conspicuously glandular-puberulent..... *H. glabra*

327. Heuchera chlorantha Piper, Contr. U.S. Nat. Herb. 16: 206. 1913.
H. cylindrica sensu Rydb., N. Amer. Fl. 22: 115. 1905.

GRAHAM ISLAND: between Skidegate and Skidegate Village, *CST21437;* Torrens Island, *CST22439;* islet off Lina Island, *CST22911;* 2 mi E of Queen Charlotte City, *CTS34787;* Haida Pt., *CT35399;* Queen Charlotte City, *CT36975;* Long Inlet, July 24, 1897, *Newcombe* (CAN); Dawson Harbour, June 1897, *Newcombe* (V); Skidegate, April 26, 1901, *Newcombe* (V).

MORESBY ISLAND: Limestone Island, *CST22402.*

Heuchera chlorantha is of local distribution on the Queen Charlotte Islands. Although it is never a conspicuous element of the vegetation, a number of colonies were found on south-facing rocky bluffs along the north shore of Skidegate Inlet between Queen Charlotte City and Skidegate Village. It also occurs on the adjacent islands and there are collections by Newcombe from Dawson Inlet and Long Inlet. The only other collection is from the south shore of Limestone Island, where a few plants were found growing on calcareous cliffs and isolated rock pillars. In addition, there is a sight record from the coastal bluffs of a rocky promontory at the north end of Gray Bay.

The presence of *H. chlorantha* on the Queen Charlotte Islands has been discussed briefly by Calder and Savile (1959*a*, p. 64). Its distribution pattern and northward migration is referred to in the Introduction.

328. Heuchera glabra Willd. ex R. & S., Syst. Veg. 6: 216. 1820.

GRAHAM ISLAND: Tow Hill, *CST21186* (DAOM), *CST22669;* Empire Anchorage, *CS21474;* between Ells and Mercer pts., *CST22893;* Dawson Inlet, *CST22938, CTS35119;* Shields Bay, *CT23309, CT23377;* Blackwater Creek, *CTS35071;* Long Inlet, *CT35922;* Dawson Harbour, July 24, 1897, *Newcombe* (CAN).

MORESBY ISLAND: near Alliford Bay, *CST21827;* head of Cumshewa Inlet, *CST22044;* Echo Harbour, *CST22320;* Takakia Lake, *CST23047, CT36339;* Mt. de la Touche, *CT23589;* between Cumshewa and Peel inlets, *CT35181;* Sunday Inlet, *CT36003;* Mt. Moresby, *CT37018;* Kitgoro Inlet, Aug. 23, 1903, *Newcombe* (V).

There is considerable variation in leaf shape and serration in *H. glabra.* Usually the primary and secondary lobes are acute with triangular, mucronate teeth, but occasionally the lobes are broadly rounded and the teeth mammiform. Plants from the Charlottes and from the coastal regions of mainland British Columbia and Alaska also have leaves often strongly pigmented with anthocyanin. We have never seen plants with reddish-tinged leaves occurring east of the Coast Mountains.

Heuchera glabra is common in rock niches and crevices along cliffs and bluffs from sea level to well above tree line. It is widely distributed throughout the Queen Charlotte Islands except in the lowland sections of eastern Graham Island, where there are few suitable habitats.

Leptarrhena

329. Leptarrhena pyrolifolia (D. Don) R. Br., Chloris Melv. 15. 1823.
L. amplexifolia (Sternb.) R. Br., *loc. cit.*

GRAHAM ISLAND: Shields Bay, *CT23372.*

MORESBY ISLAND: Takakia Lake, *CST23161, CT36350;* Mosquito Mtn., *CT23719, CT36465.*

It is surprising that this species is so rare in the Queen Charlotte Ranges because it is common and widely distributed in the mountains along the adjacent British Columbia – Alaska coast. The collections on the Islands were made along the margins of rivulets in rocky runnels well above tree line, a habitat in which snow tends to remain until late summer. *Leptarrhena pyrolifolia* probably maintains itself by vegetative reproduction, yet, in favorable years it produces flowers, for two of the plants collected in 1957 had scapes of the preceding year(s) and two plants were collected in full flower in 1964.

Mitella

330. Mitella pentandra Hook., Bot. Mag. 56: *pl.* 2933. 1829.
Pectiantia pentandra (Hook.) Rydb., N. Amer. Fl. 22: 93. 1905.

GRAHAM ISLAND: Tan Mtn., *CST21602;* Shields Bay, *CT23352;* Dawson Inlet, *CTS35088;* Jalun Lake, *CT35654;* Long Inlet, *CT35979.*

MORESBY ISLAND: Takakia Lake, *CST23062, CT36299;* Mosquito Mtn., *CT23735;* between Cumshewa and Peel inlets, *CT35202;* Mt. Russ, *CT36131.*

Mitella pentandra is an extremely uniform species; there are no apparent morphological differences between coastal and inland populations. It extends northward along the British Columbia coast to the base of the Aleutian chain in Alaska; east of the Coast Mountains it ranges northward to central Yukon. On the Queen Charlotte Islands it is essentially an alpine or subalpine species that is found throughout the Queen Charlotte Ranges on talus slopes, in open rocky runnels, and along the margins of creeks. In such habitats it occasionally extends almost to sea level. There is a sight record from the conglomerate outcrops of Towustasin Hill on the east flank of the mountains a few miles west of Juskatla.

Parnassia

331. Parnassia fimbriata König, Ann. Bot. 1: 391. 1805.

GRAHAM ISLAND: Long Inlet, *CT35959;* Yakoun Lake, Aug. 1895, *Newcombe* (V).

MORESBY ISLAND: Takakia Lake, *CST23091;* Mt. de la Touche, *CT23593;* Mosquito Mtn., *CT23716;* Hibben Island, Aug. 22, 1961, *Foster & Bigg* (UBC).

Parnassia fimbriata was observed throughout the Queen Charlotte Ranges. It is usually restricted to the moist margins of rocky runnels but it occurs occasionally on adjacent grassy slopes. This subalpine species extends nearly to sea level on the exposed west coast. *Parnassia fimbriata* is a late-flowering species and only a few flowering colonies were found in the 1957 and 1964 surveys.

Ribes

Stems with spines or prickles	*R. lacustre*
Stems without spines or prickles	
Ovary with sessile, greenish-yellow glands	*R. bracteosum*
Ovary with prominently stalked, reddish glands	*R. laxiflorum*

332. Ribes bracteosum Dougl. in Hook., Fl. Bor.-Amer. 1: 233. 1832.

GRAHAM ISLAND: Queen Charlotte City, *CST20905;* about 3 mi S of Masset, *CST21276;* Skidegate, *CST22454*, June 4, 1910, *Spreadborough* (CAN, V); Langara Island, *CST22545*, June 1, 1952, *Guiget* (V); near Juskatla, *T37;* Dawson Inlet, *CTS35124;* Long Inlet, *CT35971*, *CT35980;* Port Clements, *CT36891;* between Queen Charlotte City and Skidegate, June 1, 1951, *Cowan* (UBC).

MORESBY ISLAND: head of Cumshewa Inlet, *CST20956;* Copper Creek, *CST21000;* Sandspit, *CST21087;* between Skidegate Lake and Copper Bay, *CST21912*, *CT23676*, *CT36076;* Fairfax Inlet, *CT23617;* Bigsby Inlet, *CTS34909;* Crescent Inlet, *CTS34984;* Richardson Island, *CTS34994;* Sunday Inlet,

CT36635; Skedans, May 1901, *Newcombe* (V); Kaisun, June 1901, *Newcombe* (V); Lockeport, May 22, 1923, *Newcombe* (V).

Ribes bracteosum is especially common on open stream banks near the coast, but occurs on bluffs, in logged-over areas, along forest margins, and in other partially shaded habitats. It is widely distributed in the Queen Charlotte Islands, but is rarely a conspicuous element of the vegetation. At Fairfax Inlet, where we camped for three days, it formed open thickets along the upper limits of the tidal beach bordering the spruce–hemlock forest.The arching canes bearing long racemes of black fruit with a distinct whitish bloom stood out conspicuously against the green coniferous background. Some of the plants of this colony grew below maximum spring-tide level and they exemplify the degree to which *R. bracteosum* can tolerate temporary saline conditions.

333. Ribes lacustre (Pers.) Poir. in Lam., Encycl. Méth. Bot. Suppl. 2:856. 1812.
R. oxyacanthoides var. *lacustre* Pers., Syn. Pl. 1: 252. 1805.

GRAHAM ISLAND: Haida Pt., *CST20877*, *CST23450*, *CT36684;* Image Pt., *CST23254;* between Skidegate and Skidegate Village, *CST23411;* Towustasin Hill, *CT35533;* Yakoun River 4½ mi S of Port Clements, *CT36889;* Long Inlet, July 24, 1897, *Newcombe* (CAN); between Queen Charlotte City and Skidegate, June 1, 1951, *Cowan* (UBC).

MORESBY ISLAND: near Alliford Bay, *CST21071*, *CT36263*, *CT36487;* Sandspit, *CST21847;* Limestone Island, *CST22408*, *CTS34821;* mouth of Deena River, *CT23797*.

Ribes lacustre is locally common on the open cliffs and bluffs bordering Skidegate Inlet. The only other coastal record is from Limestone Island, where a few shrubs were found on a rock stack along the south shore. This species cannot tolerate closed forest conditions, but rapidly becomes established and forms thickets in logged-over areas, such as the one along the Yakoun River (*CT36889*). The occurrence of *R. lacustre* on Towustasin Hill, an inland dry-land relict site, is discussed in the Introduction.

334. Ribes laxiflorum Pursh, Fl. Amer. Sept. 731. 1814.

GRAHAM ISLAND: near Lawnhill, *CST20902*, *CST21731;* Tow Hill, *CST21198*, *CST22675* (DAOM); Empire Anchorage, *CS21442;* Yakoun River Delta, *CST21544;* Kumdis Creek, *CST22115;* Langara Island, *CST22551;* near Masset Spit, *CST23847*, *CT35701;* Juskatla, *T127* (DAOM); near junction of Yakoun River and Ghost Creek, *CT35507;* Naden Harbour, *CT36847;* Skidegate, June 2, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: Sandspit, *CST21846;* East Copper Island, *CST22200;* 2 mi S of Sandspit, *CT36087;* near Alliford Bay, *CT36257;* Limestone Island, April 26, 1901, *Newcombe* (V).

Ribes laxiflorum is common and widely distributed on exposed cliffs, rocky knolls, and in open habitats along the margins of woods. It was noted a number of times in small openings in the dense coniferous forest where windfalls allowed some light to penetrate the almost continuous canopy. Here we found shrubs, often sterile, perched high above the forest floor on overturned stumps and decaying logs.

The leaves of *R. laxiflorum* are 5-lobed; the lower surfaces glabrous or slightly pubescent with small reddish glands. Sterile specimens can be readily distinguished from *R. bracteosum* which has 5- to 7-lobed leaves with conspicuous pale resinous dots beneath.

Saxifraga

Plants low, mat-forming or rhizomatous perennials with well-developed stem leaves
- Rosette leaves entire
  - Leaves opposite; petals purple ..... *S. oppositifolia*
  - Leaves alternate; petals white ..... *S. tolmiei*
- Rosette leaves distinctly toothed
  - Leaves and stems glandular-pubescent, leaf margin without conspicuous cilia ..... *S. caespitosa*
  - Leaves and stems glabrous, leaf margins conspicuously ciliate ..... *S. taylori*

Plants upright, never rhizomatous, subscapose perennials
- Leaves orbicular or reniform, usually as broad as long, usually cordate
  - Leaves with 2- to 3-toothed lobes; always some flowers replaced by bulbils ..... *S. mertensiana*
  - Leaves regularly lobed, lobes not toothed; inflorescence never bulbiferous ..... *S. punctata*
- Leaves flabellate or spatulate
  - Leaves distinctly petioled; plants from a well-developed branched and creeping caudex ..... *S. lyallii*
  - Leaves sessile; plants from a short erect unbranched caudex ..... *S. ferruginea*

335. Saxifraga caespitosa L., Sp. Pl. 1: 404. 1753.

GRAHAM ISLAND: Towustasin Hill, *CT35527.*

MORESBY ISLAND: South Low Island, *CTS34834;* Limestone Island, June 9, 1913, *Newcombe* (V).

Saxifraga caespitosa is a circumpolar species found throughout most of the Cordilleran region of North America. A number of segregates have been described but are poorly understood. We recognize the Queen Charlotte Island material as belonging to *S. caespitosa* in the broad sense and leave the taxonomic disposition

of the segregates of this complex to a monographer because such a project is beyond the scope of this flora.

Saxifraga caespitosa was first reported from the Queen Charlotte Islands by Carter and Newcombe (1921, p. 47) and this record was undoubtedly based on the Newcombe collection from Limestone Island. This species was collected during our 1964 survey on South Low Island (near Limestone Island), where it was restricted to a limestone outcrop at the east end of the island (*see* Figure 53). Later in the season a single plant of *S. caespitosa* was collected on rock cliffs at the base of Towustasin Hill near Juskatla. The significance of this dry-land relict site is discussed in the Introduction.

336. Saxifraga ferruginea Grah., Edinb. New Phil. J. 1828: 348. 1829. **Figure 137.**

Saxifraga stellaris var. *brunoniana* Bong., Mém. Acad. St. Pétersb. VI. 2: 140. 1832; *S. leucanthemifolia* var. *brunoniana* (Bong.) Engler, Monogr. Saxifr. 135. 1872; *Spatularia brunoniana* (Bong.) Small, N. Amer. Fl. 22: 149. 1905.

Spatularia newcombei Small, Torreya 2: 55. 1902; *Saxifraga newcombei* (Small) Engl. & Irmsch., Pflanzenreich IV. 117: 70. 1916.

Spatularia ferruginea (Grah.) Small, *op. cit.* 150; *Hydatica ferruginea* (Grah.) Small, N. Amer. Fl. 22: 554. 1918.

Saxifraga ferruginea var. *grandiflora* Johnson, Minn. Stud. Pl. Sci. 4: 62. 1923.

Saxifraga ferruginea var. *cuneata* Johnson, *op. cit.* 63.

Saxifraga ferruginea var. *diffusa* Johnson, *op. cit.* 63.

Saxifraga ferruginea var. *macounii sensu* Hultén, Fl. Alaska & Yukon 5: 914. 1945.

Saxifraga bongardi Presl, as to Alaska and British Columbia coast plants.

GRAHAM ISLAND: Haida Pt., *CST20863;* Image Pt., *CST21418;* Tan Mtn., *CST21576;* McClinton Bay, *CST21650;* Dawson Inlet, *CST22837, CTS35111;* between Ells and Mercer pts., *CST22927;* Shields Bay, *CT23273, CT23333;* Mamin River Delta, *T114;* Towustasin Hill, *CT35525;* Jalun Lake, *CT35652;* Long Inlet, *CT35996;* Mt. Needham, June 18, 1961, *Foster & Bigg* (UBC); Marble Island, June 16, 1961, *Foster & Bigg* (UBC); Skidegate, June 1891 and May 11, 1901, *Newcombe* (V), June 2, 1910, *Spreadborough* (CAN); Yakoun Lake, Aug. 1895, *Newcombe* (V).

MORESBY ISLAND: head of Cumshewa Inlet, *CST20962;* near Alliford Bay, *CST21048, CT36260;* Newcombe Peak, *CST22019;* head of Bigsby Inlet, *CST22134, CTS34913;* small islet at mouth of Huston Inlet, *CST22195;* Echo Harbour, *CST22321;* outer Skedans Island, *CST22387;* Takakia Lake, *CST23081, CT36325, Foster & Joslin 60* (UBC); Mt. de la Touche, *CT23514;* Mosquito Mtn., *CT23722, CT36469;* South Low Island, *CTS34848;* Tuft Islets, *CTS34879;* Anna Inlet, *CTS34942;* Dass Pt., *CTS35021;* between Cumshewa and Peel inlets, *CT35174;* Mt. Moresby, *CT35314*, July 13, 1961, *Foster & Bigg* (DAO, UBC); Yatza Mtn., *CT35746;* Mt. Russ, *CT36154;* Sunday Inlet, *CT36675;* islet near Bolkus Islands, *Foster & Joslin 82* (UBC); Tasu Sound, June 26, 1961, *Foster & Bigg* (UBC); Chaatl Village, Aug. 1895, *Newcombe* (V), July 29, 1910, *Spreadborough* (CAN); Kitgoro, June 30, 1897, *Newcombe* (CAN, V); Ninstints, June 1901 and July 1903, *Newcombe* (V); Poole Pt., Burnaby Island, June 14, 1913, *Newcombe* (V).

Saxifraga ferruginea is a widely distributed Cordilleran species that shows considerable variation in height, leaf texture, vesture, floriferous versus bulbiferous nature of the inflorescence, and size of floral parts. This species also has a wide range of ecological tolerance and is found from sea level to alpine summits. The phenotypical and ecological plasticity has provided the basis for the description of a large number of entities and there is a voluminous and confusing nomenclature. We have examined a large and representative series of specimens from throughout the range of *S. ferruginea* and have concluded that with the possible exception of var. *macounii* Engl. & Irmsch. (Hitchcock *et al.*, 1964, p. 42) segregation into specific and infraspecific categories is not warranted for any part of the population that occurs along the British Columbia – Alaska coast. The status of the dubious var. *macounii*, which is reported as occurring from southern British Columbia to California and is characterized by partial replacement of flowers by bulbils, cannot be evaluated until a careful cytological and morphological study is completed and the taxonomic disposition of the *S. ferruginea–S. bryophora* complex is re-evaluated. The northern population is considered to belong to the typical phase of *S. ferruginea*, which was described by Graham on the basis of plants grown in Edinburgh from seeds collected by Richardson in the Rocky Mountains of Canada. Several entities have been described from the Queen Charlotte Islands and the nearby southern portion of the Alaska panhandle. Although plants from a particular habitat may appear to be quite distinct, examination of a series of collections from the same general region, but

Figure 137. *Saxifraga ferruginea* Grah. on rock bluffs near shoreline at Image Point, Skidegate Inlet, Graham Island.



from differing habitats, reveals no clear-cut diagnostic characters. Such is the case on the Queen Charlotte Islands, where we have collected a large body of material. Plants from exposed coastal habitats possess thick, often densely pubescent, leaves and stems and there is a tendency for inflorescences to be almost completely floriferous. Such plants were described as a distinct species, *Spatularia newcombei*, or as a distinct variety, var. *diffusa*, of *Saxifraga ferruginea*. However, when these plants are compared with inland populations (lowland and alpine or subalpine clones), no diagnostic characters can be found for separation of the two ecotypes. The inland material may have some of the flowers replaced by bulbils, and the leaves may be either glabrous with a ciliate margin or pubescent. We have noted all types within a single colony. Thus, on the basis of field and herbarium studies, we include all northern coastal and inland material in a single taxon, *S. ferruginea*, and do not recognize any of the infraspecific segregates.

Saxifraga ferruginea is the most common saxifrage on the Charlottes. It is widely distributed and was found in many different habitats. This species forms extensive, showy colonies on exposed rocky headlands and bird-nesting islands along the east coast.

337. Saxifraga lyallii Engl. ssp. **hultenii** Calder & Savile, Can. J. Bot. 43: 1393. 1965.
S. lyallii var. *hultenii* Calder & Savile, Can. J. Bot. 38: 418. 1960.

GRAHAM ISLAND: Long Inlet, *CT35955*.

MORESBY ISLAND: Takakia Lake, *CST23106* (Holotype), *CT36282;* Mosquito Mtn., *CT23696*, *CT36462;* Mt. Morseby, *CT36403*.

Saxifraga lyallii ssp. *hultenii* has distinctly fan-shaped leaves (Figure 139) and is a taller plant than the spatulate-leaved (Figure 138) ssp. *lyallii*. The former is widely distributed throughout British Columbia, except in the Cascades and southern Rocky Mountains, and it extends northward along the coast to the Alaska Peninsula and inland to central Alaska and Yukon. The essentially allopatric ssp. *lyallii* is an alpine race of the Cascade Mountains of British Columbia and extreme northern Washington, and the Rocky Mountains from Jasper National Park south to central Montana.

Subspecies *hultenii* is rare on the Queen Charlotte Islands. It occurs in rock niches along the margins of steep runnels, by rivulets on open rocky and heathy slopes, and on sparsely vegetated slopes in the Queen Charlotte Ranges. At Takakia Lake, on Mount Moresby and Mosquito Mountain, and at the head of Long Inlet, it was found growing in association with *S. punctata* ssp. *carlottae* Calder & Savile.

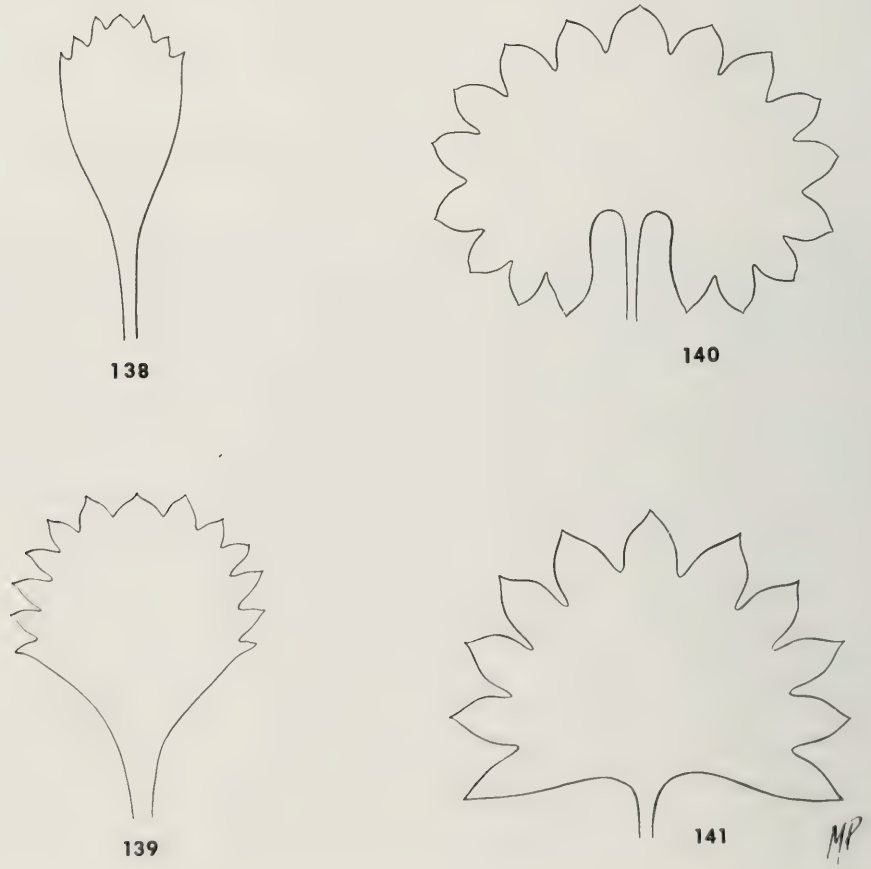
338. Saxifraga mertensiana Bong., Mém. Acad. St. Pétersb. VI. 2: 141. 1832.
S. mertensiana var. *bulbillifera* Engler & Irmscher, Pflanzenreich IV. 117: 15. 1916.
S. mertensiana var. *eastwoodiae* (Small) Engler & Irmscher, *loc. cit.*

GRAHAM ISLAND: Empire Anchorage, *CS21463;* Tan Mtn., *CST21580;*

McClinton Bay, *CST21672;* Blackwater Creek, *T40*, *S3532*, *CTS35053;* Dawson Inlet, *CTS35089;* Jalun Lake, *CT35640;* Long Inlet, *CT35960;* Marble Island, June 16, 1961, *Foster & Bigg* (UBC).

MORESBY ISLANDS: Newcombe Peak, *CST22030;* Takakia Lake, *CST23095;* Mt. de la Touche, *CT23512;* Bigsby Inlet, *CTS34906;* Anna Inlet, *CTS34928;* between Cumshewa and Peel inlets, *CT35201;* Mt. Moresby, *CT35318;* Mt. Russ, *CT36149;* Tasu Inlet, June 1901, *Newcombe* (V).

On the Queen Charlotte Islands plants of *S. mertensiana* produce many bulbils and only a few flowers. Hultén (1945, p. 924) noted a similar development in plants from Alaska, and most collections from British Columbia northward are of this type. In populations further to the south along the Pacific coast, a higher proportion of flowers to bulbils are produced in an inflorescence and these more profusely flowering plants were described by Small in 1905 as a separate species *Hetersia* (*Saxifraga*) *eastwoodiae*. However, the replacement of flowers by bulbils as one goes northward, or from low to high altitudes, is a well-known



Figures 138–141. 138. *Saxifraga lyallii* Engl. ssp. *lyallii*, basal leaf (× 1). 139. *S. lyallii* Engl. ssp. *hultenii* Calder & Savile, basal leaf (× 1). 140. *S. punctata* L. ssp. *cascadensis* Calder & Savile, basal leaf (× 1). 141. *S. punctata* L. ssp. *carlottae* Calder & Savile, basal leaf (× 1).

phenomenon in the Saxifragaceae and does not provide a sound basis for separation of entities. Although the southern population of *S. mertensiana* from along the Pacific coast cannot be segregated on the basis of its higher proportion of flowers to bulbils, it does seem to differ in leaf shape and serration from northern plants and may well deserve formal recognition on these bases.

Most of the collections of *S. mertensiana* were made in the general region of the Queen Charlotte Ranges, where it occurs on wet cliff faces or in rocky runnels in the subalpine zone. A few collections were made in a lowland site on the east flank of the central mountain mass near a falls on Blackwater Creek southwest of Juskatla.

339. Saxifraga oppositifolia L., Sp. Pl. 1: 402. 1753. **Figure 142.**

MORESBY ISLAND: Takakia Lake, *CST23087*, *CT36367;* Mt. Russ, *CT36196;* Mt. Moresby, *CT36377;* Mosquito Mtn., *CT36460;* Tasu Sound, June 1, 1960, *Brown* (V), June 26, 1961, *Foster & Bigg* (UBC).

Saxifraga oppositifolia is a common and widespread element of alpine areas on mainland British Columbia. On the Queen Charlotte Islands it is represented by a few colonies limited to the highest mountain masses of the Queen Charlotte Ranges. Many of the plants in these colonies produced no flowers or fruits and it appears as though this high arctic and alpine species is near the limit of its environmental tolerance on the Charlottes.

Figure 142. *Saxifraga oppositifolia* L., on Tasu Mountain, Tasu Sound, on the west coast of Moresby Island. (Photograph courtesy Dr. A. Sutherland Brown.)



340. Saxifraga punctata L., Sp. Pl. 1: 401. 1753.

Largest leaves with usually 9–12 teeth, usually truncate or shallowly cordate (Figure 141); capsules 6–12 mm long..... ssp. *carlottae*
Largest leaves with usually 12–18 teeth, distinctly cordate (Figure 140); capsules 3–8 mm long..... ssp. *cascadensis*

340a. Saxifraga punctata L., ssp. **carlottae** Calder & Savile, Can. J. Bot. 38: 423. 1960. **Figure 190.**

GRAHAM ISLAND: Tan Mtn., *CST21617;* Shields Bay, *CT23340;* Dawson Inlet, *CTS35116;* Jalun Lake, *CT35674*, Long Inlet, *CT35953.*

MORESBY ISLAND: Takakia Lake, *CST23093* (Holotype), *CT36348*, *Foster & Joslin 50D* (UBC); Mt. de la Touche, *CT23513;* Mosquito Mtn., *CT23702, CT36463.*

340b. Saxifraga punctata L. ssp. **cascadensis** Calder & Savile, Can. J. Bot. 38: 425. 1960.
Micranthes aestivalis sensu Small, N. Amer. Fl. 22: 147. 1905, in part.
Saxifraga paddoensis Suksd., W. Amer. Sci. 15: 59. 1906.

MORESBY ISLAND: Takakia Lake, *CST23113;* Mosquito Mtn., *CT23763;* between Cumshewa and Peel inlets, *CT35187;* Mt. Russ, *CT36167.*

The North American subspecies of *S. punctata* have been discussed in detail by Calder and Savile (1960). More recently Webb (1964, p. 153) has rejected *S. punctata* of Linnaeus as a *nomen ambiguum* and has taken up Willdenow's *S. davurica* for the plant in the Linnaean Herbarium (Cat. Linn. Herb. 575.24) that has cuneate-tapering leaf bases. He has designated as *S. nelsoniana* D. Don the widely distributed plant with reniform to orbicular leaves that has been previously recognized as *S. punctata* in both Eurasia and North America. Although Webb's interpretation of these species may be correct, only a detailed study of the entire complex as it occurs in Eurasia will clarify the nomenclatural status of the various entities. Until it is clearly shown that *S. punctata* is a *nomen ambiguum* we are retaining the epithet *punctata.*

Saxifraga punctata ssp. *cascadensis* and ssp. *carlottae* are North American races of local and restricted distribution. Subspecies *carlottae* is an endemic of the Queen Charlotte Islands and adjacent mainland coast, where it freely intergrades with ssp. *pacifica* Hult. and ssp. *porsildiana* Calder & Savile. Subspecies *cascadensis* is a race of the Cascade Mountains of southern British Columbia and Washington with a disjunct population in the Queen Charlotte Islands. The significance of endemism and the presence of disjunct populations in the Charlottes is discussed in the Introduction.

On the Queen Charlotte Islands ssp. *cascadensis* and ssp. *carlottae* are confined to the mountain ranges. Although a number of plants show some signs of

intergradation, the two races are essentially distinct and occupy slightly different ecological niches. Plants of ssp. *cascadensis* are not quite typical, because the leaves are slightly pubescent and the hairs of the panicle branches are more or less erect rather than appressed, characters which are evidently derived from ssp. *carlottae*. However, the leaves are distinctly cordate in ssp. *cascadensis*, in contrast to the truncate or shallowly cordate leaves of ssp. *carlottae*. The latter subspecies also differs from the former in having stouter panicle branches and pedicels, and much longer capsules. Both subspecies are found in runnels on open rocky slopes above tree line. Here the later-flowering ssp. *cascadensis* is confined to the margins of rivulets, whereas ssp. *carlottae* occurs in nearby drier habitats. The latter is more widely distributed and is also found on talus slopes, in protected areas below rock cliffs, and occasional plants occur on gravel bars along creeks in dense coniferous woods on the lower slopes of the mountains near sea level.

341. Saxifraga taylori Calder & Savile, Brittonia 11: 248. 1959. **Figures 143-146.**
Leptasea vespertina sensu Small, N. Amer. Fl. 22: 153. 1905.

GRAHAM ISLAND: between Ells and Mercer pts., *CST22866;* Towustasin Hill, *CT35523;* Dawson Inlet, Aug. 1961, *Foster & Bigg* (UBC).

MORESBY ISLAND: Newcombe Peak, *CST22000;* Takakia Lake, *CST23085*, *CT36272;* Mt. de la Touche, *CT23511* (Holotype); Mosquito Mtn., *CT23704;* Mt. Moresby, *CT36408*, *CT36455*, July 13, 1961, *Foster & Bigg* (UBC); Yatza Mtn., *CT35712;* Canoe Pass off Skidegate Channel, July 26, 1910, *Spreadborough* (NY, V); Tasu Sound, June 26, 1961, *Foster & Bigg* (UBC).

The morphology and taxonomic relationships of *S. taylori*, an endemic of the Queen Charlotte Islands, were discussed in detail by Calder and Savile (1959*b*) when treating the North American species of *Saxifraga* of the section *Trachyphyllum*. Until 1957 this species was known from a single collection made by Spreadborough at Canoe Pass near the west end of Skidegate Channel, which separates Graham and Moresby islands. In 1905 Small assigned the collection to *Leptasea* (*Saxifraga*) *vespertina* Small, a closely related species from which it is readily distinguished by its unspotted petals and tricuspidate leaves with conspicuous cartilaginous margins.

Saxifraga taylori is essentially an alpine species of rocky cliffs and slopes of the subalpine and alpine zones. Although it may be found in almost any rocky habitat, it tends to avoid the more exposed situations of the uppermost slopes and peaks. It forms extensive colonies on talus slopes and rock slides (Figure 147), especially in late-snow areas, and is a pioneer colonizer that occasionally forms the dominant ground cover. It usually occurs above 1,500 ft but is also found at lower elevations, especially on the west coast, where a number of montane species come down almost to sea level on exposed slopes. The Towustasin Hill station is in the transition zone between the Queen Charlotte Ranges and the eastern Graham Island lowlands.



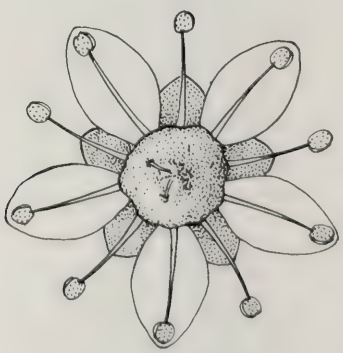
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Figures 143–146. *Saxifraga taylori* Calder & Savile. 143. Habit (× ½). 144. Mature capsule (× 2½). 145. Mature seed (× 20). 146. Flower (× 2).

342. Saxifraga tolmiei T. & G., Fl. N. Amer. 1: 567. 1840.

GRAHAM ISLAND: Shields Bay, *CT23354.*

MORESBY ISLAND: Takakia Lake, *CST23138, Foster & Joslin 50B* (UBC); Mosquito Mtn. *CT23732, CT36451.*

Saxifraga tolmiei is widely distributed throughout the Cordilleran region of North America. All plants from British Columbia and Alaska belong to the typical phase, which is characterized by a prominently glandular inflorescence and glandular ciliation at the base of the leaves.

This species is restricted to snow-bed communities in wet depressions on talus slopes and was noted on only three mountains in the Queen Charlotte Ranges.

Tellima

343. Tellima grandiflora (Pursh) Dougl. in Lindl., Bot. Reg. 14: *pl.* 1178. 1828.
T. odorata Howell, Fl. NW. Amer. 199. 1898.
T. breviflora Rydb., N. Amer. Fl. 22: 90. 1905.

GRAHAM ISLAND: between Queen Charlotte City and Skidegate Village, *CST20878;* 3½ mi S of Masset, *CST21269;* near Lawnhill, *CST21734,*

Figure 147. James A. Calder collecting *Saxifraga taylori* Calder & Savile on coarse talus slope at southeast end of Takakia Lake at about 1,900 feet.



CST23400B; Tow Hill, *CST22674, CTS34761;* Queen Charlotte City, *CST23013* (DAOM); Image Pt., *CTS34687;* Dawson Harbour, June 24, 1897, *Newcombe* (CAN); Skidegate, May and June, 1901, *Newcombe* (V).

MORESBY ISLAND: Copper Bay, *CST20974;* near Alliford Bay, *CST21070;* Alliford Bay, *CST21132;* East Copper Island, *CST22253;* Limestone Island, *CST22421, CTS34812;* mouth of Deena River, *CT23765;* Lockeport, May 22, 1923, *Newcombe* (V).

On the Queen Charlotte Islands *T. grandiflora* is a lowland species found only at or near the coast on open cliffs and rocky bluffs, in thickets, and in or along the margins of open woods. It was not collected on the west coast but it was noted on rocky outcrops at Henslung Bay on the south shore of Langara Island and on limestone cliffs at the shoreline just east of the abandoned Indian village of Kaisun. The flowers of *Tellima* are cream-colored to greenish white when young but they are usually pink or pinkish-tinged at maturity.

Tiarella

Leaves compound, trifoliolate..... *T. trifoliata*
Leaves simple, 3- to 5-lobed..... *T. unifoliata*

344. Tiarella trifoliata L., Sp. Pl. 1: 406. 1753.
T. laciniata sensu Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 48. 1921.

GRAHAM ISLAND: Queen Charlotte City, *CST20912;* 3½ mi S of Masset, *CST21268;* Empire Anchorage, *CS21488;* McClinton Bay, *CST21647;* Langara Island, *CST22519;* near Masset Spit, *CST22799;* Dawson Inlet, *CST22838, CTS35086;* Shields Bay, *CT23314;* Lawnhill, *CST23400A;* Blackwater Creek, *T42, CTS35067;* Marie Lake, *T87;* Image Pt., *CTS34680;* Yakoun Lake, *CT36778*, Aug. 1895, *Newcombe* (V); Skidegate, May 10, 1901, *Newcombe* (V); Masset, Sept. 25, 1912, *Green* (UBC); Marble Island, June 16, 1961, *Foster & Bigg* (UBC); Honna River trail, June 5, 1952, *Pillsbury* (UBC).

MORESBY ISLAND: head of Cumshewa Inlet, *CST20961A;* Sandspit, *CST21098;* Bigsby Inlet, *CST22136;* Echo Harbour, *CST22323;* Takakia Lake, *CST23098B;* Mt. de la Touche, *CT23515;* mouth of Deena River, *CT23776;* Crescent Inlet, *CTS34997;* Sunday Inlet, *CT36630;* Ikeda, June 10, 1913, *Newcombe* (UBC, V); Copper Bay, *Foster & Joslin 17* (UBC); Little Goose Bay, Sept. 10, 1951, *Pillsbury* (UBC); Church Creek, June 8, 1952, *Pillsbury* (UBC); Mt. Moresby, July 13, 1961, *Foster & Bigg* (UBC).

There is considerable variation in the degree of pubescence and serration of the leaves in the collections of *T. trifoliata* from the Islands but the leaves are never as deeply lobed as in *T. laciniata* Hook., which, as far as we are aware, does not extend north of Vancouver Island. There is possibly some introgression where the two species occur together on Vancouver Island.

Tiarella trifoliata is a widespread and common element of both lowland and

subalpine forests. It tolerates the dense shady conditions of climax forests and also occurs in the semiopen margins of woods. The Carter and Newcombe report of *T. laciniata* from the Islands was probably based on an atypical collection of *T. trifoliata* with deeply incised leaflets.

345. Tiarella unifoliata Hook., Fl. Bor.-Amer. 1: 238. 1832.

GRAHAM ISLAND: Langara Island, *CST22549;* Shields Bay, *CT23339;* Skidegate, 1897, *Newcombe* (V).

MORESBY ISLAND: Takakia Lake, *CST23098A*, *CT36320*, *Foster & Joslin 68* (UBC); Mt. Moresby, *CT37016*.

The relationship of *T. unifoliata* to *T. trifoliata* L. is not well understood and a detailed biosystematic study is needed. Leaf type appears to be the only character that separates the two species. A single plant from the alpine Takakia Lake south of Moresby Logging Camp (*CST23098C*) is presumably of hybrid origin as it has the following leaf types: two trifoliolate basal rosette leaves, one bifoliolate basal leaf, one simple basal leaf, and a single trifoliolate cauline leaf. Both species were common on the open, grassy slopes at tree line at this locality. A similar intermediate plant has been noted in a collection from Chelan County in Washington State. *Tiarella unifoliata* and *T. trifoliata* occur sympatrically throughout much of their ranges.

Tiarella unifoliata is a rare forest species on the Queen Charlotte Islands. It was found in only a few localities; two on the west coast, two in subalpine areas in the Queen Charlotte Ranges near the head of Cumshewa Inlet, and two on the immediate eastern flanks of the Queen Charlotte Ranges of Graham Island. The Newcombe collection labeled Skidegate undoubtedly comes from the mountains immediately west and north of the town.

Tolmiea

346. Tolmiea menziesii (Pursh) T. & G., Fl. N. Amer. 1: 582. 1840.
Tiarella menziesii Pursh, Fl. Amer. Sept. 313. 1814; *Leptaxis menziesii* (Pursh) Raf., Fl. Tellur. 2: 75. 1837.

GRAHAM ISLAND: Queen Charlotte City, *CST21538;* McClinton Bay, *CST21649;* 6 mi S of Juskatla, *CT35489;* Long Inlet, *CT35991;* Yakoun Lake, *CT36777;* Gold Creek, June 13, 1952, *Schmidt;* Dawson Harbour, July 26, 1897, *Newcombe* (CAN).

MORESBY ISLAND: Copper Bay, *CST21905;* head of Cumshewa Inlet, *CST22042;* Crescent Inlet, *CTS34979;* between Cumshewa and Peel inlets, *CT35178;* Kaisun, *CT36566;* Ikeda, June 10, 1913, *Newcombe* (V).

Tolmiea menziesii occurs almost exclusively along stream banks at low elevations in the dense coniferous forests of the Queen Charlotte Ranges and lowlands of Graham and Moresby islands. There is a significant gap in its

distribution along the mainland coast between northern Vancouver Island and the stations cited, but we do not know whether this gap is real or merely a reflection of inadequate collecting in this intervening area.

Dr. Savile (pers. comm.) states that the deep-throated, brownish, asymmetrical flowers, so unusual for the Saxifragaceae, are adapted for pollination by Lepidoptera, specifically butterflies, but this has not been substantiated by field observations.

Rosaceae

Plants armed with spines or prickles
- Trees with stout rigid conical spines 1 cm or more long. *Crataegus*
- Shrubs or vines with prickles, if spiny the spines either less than 1 cm long or broad-based and flattened
  - Leaves pinnate, usually with 5 or more regularly serrate obtuse leaflets. . . . . *Rosa*
  - Leaves 3- to 5-foliolate, leaflets acute and usually acuminate, laciniate to irregularly or doubly serrate, often lobed. . . . . *Rubus*

Plants not armed with spines or prickles
- Leaves compound
  - Trees with pinnate leaves. . . . . *Sorbus*
  - Shrubs or herbaceous plants
    - Leaves trifoliolate
      - Leaflets 2- to 5-toothed, at the apex only. . . . . *Sibbaldia*
      - Leaflets with many teeth
        - Terminal leaflet never distinctly petiolulate. . . *Potentilla*
        - Terminal leaflet distinctly petiolulate
          - Leaves pedately 3-foliolate; leaflets irregularly or doubly serrate. . . . . *Rubus*
          - Leaves not pedately 3-foliolate; leaflets regularly crenate or serrate. . . . . *Fragaria*
    - Leaves not trifoliolate
      - Basal leaves 2 to 3 times pinnate. . . . . *Aruncus*
      - Basal leaves once pinnate
        - Basal leaves with lobulate and (or) deeply incised leaflets. . . . . *Geum*
        - Basal leaves with neither lobulate nor deeply incised leaflets
          - Leaflets cuneate at base. . . . . *Potentilla*
          - Leaflets truncate at base or cordate. . . . . *Sanguisorba*
- Leaves simple
  - Plants annual; leaves deeply dissected and lobed. . . . *Aphanes*
  - Plants perennial
    - Plants herbaceous, up to 20 cm high
      - Leaves biternate, lacking stipules. . . . . *Luetkea*

Leaves essentially 5-lobed, stipules present	*Rubus*
Trees, shrubs, or herbaceous plants more than 20 cm high	
Leaves never lobed	
Inflorescence an elongate or pyramidal panicle	*Spiraea*
Inflorescence not as in *Spiraea*	
Flowers in short racemes; petioles, peduncles, and pedicels never densely pubescent at base	*Amelanchier*
Flowers in corymbs; petioles, penduncles, and pedicels densely pubescent at base.	*Pyrus*
Leaves lobed	
Leaves palmately 3- to 7-lobed, deeply cordate at base; petioles glandular stipitate	*Rubus*
Leaves never palmately lobed, petioles not glandular stipitate	
Leaves deeply cleft, 3- to 7-lobed	*Crataegus*
Leaves never deeply cleft, 1- to 2-lobed	*Pyrus*

Amelanchier

347. Amelanchier florida Lindl., Bot. Reg. 19: *pl.* 1589. 1883.

GRAHAM ISLAND: between Queen Charlotte City and Skidegate Village, *CST20871*, June 1, 1951, *Cowan* (UBC); Tlell, *CST21366;* Torrens Island, *CST22442;* Queen Charlotte City, *CST23032* (DAOM); Image Pt., *CTS34671;* Skidegate, June 1901, *Newcombe* (V), June 12, 1910, *Spreadborough* (CAN); Long Inlet, July 26, 1897, *Newcombe* (CAN).

MORESBY ISLAND: Mosquito Lake, *CST21022;* Alliford Bay, *CST21051;* head of Cumshewa Inlet, *CST21989;* Limestone Island, *CST22410*, June 9, 1913, *Newcombe* (UBC); Hotspring Island, *CST22289;* South Low Island, *CTS34832;* Dass Pt., *CTS35018*.

The taxonomic disposition of the taxa within the genus *Amelanchier* has perplexed and frustrated systematists. Early workers usually considered that the genus consisted of one or at most a few highly variable species. Later workers, notably Wiegand and Jones, subdivided the genus into a large number of species. Of particular interest is the work of Jones (1946), who recognizes four taxa for western Canada, three of which are at the species level. On the basis of their geographical distributions his segregation is quite plausible. However, as anyone who has attempted to identify these taxa knows, the diagnostic characters used to segregate the four entities are most difficult to define and recognize, and subsequent identification is usually tentative and influenced by the geographical locality from which the specimen was collected. There is little doubt that a large proportion of specimens in herbaria could not be

segregated into specific taxa if the researcher did not know where the specimen had been collected. Most of the western Canadian material can be sorted into three more or less distinct groups, but a large number of specimens, particularly those from British Columbia, cannot be segregated easily. The variable nature of *Amelanchier* can be partly attributed to the high degree of outcrossing and the subsequent development of heterogenetic populations. In addition there is some evidence that polyploidy exists in the genus.

Perhaps for the reasons just discussed, the Pacific Northwest complex of *Amelanchier* has been treated conservatively by Hitchcock (1961) as consisting of two wide-ranging species, *A. alnifolia* Nutt. and *A. utahensis* Koehne. The latter is found only in the central and southwestern regions of United States and adjacent Mexico and is not pertinent to our discussion. Hitchcock considers all our western Canadian material to be *A. alnifolia* and recognizes five varieties. Plants from the northern coastal British Columbia population, which would include the Queen Charlotte Islands, are treated by Hitchcock as *A. alnifolia* var. *semiintegrifolia* (Hook.) C. L. Hitchc. (=*A. florida*). Criticisms similar to those those discussed in the preceding paragraph can be applied to Hitchcock's recognition of five varieties. Perhaps here is a case in point for the use of the term **aggregate** as it has been applied and used in a British flora (Clapham *et al.*, 1962). *Amelanchier* is a good example of a genus in which highly variable groups cannot be pigeonholed into taxa when the complex mechanisms giving rise to the variation within each group are not fully understood. It should simply be admitted that such a classification is misleading and that the complex should be recognized as an aggregate.

We consider the Queen Charlotte Island population to be a portion of the *A. alnifolia* agg., but are following most American authors in identifying the coastal population as *A. florida.*

Amelanchier is restricted to open bluffs and small islands along the east coast of the Queen Charlotte Islands. Plants from more exposed sites are often stunted but set abundant fruit. A few colonies from along the shores of Skidegate Inlet contain shrubs up to about 5 m in height.

Aphanes

348. Aphanes occidentalis (Nutt.) Rydb., N. Am. Fl. 22: 380. 1908.
Alchemilla occidentalis Nutt. in T. & G., Fl. N. Amer. 1: 432. 1840.

GRAHAM ISLAND: Queen Charlotte City, *CST23020.*

The genus *Aphanes* is considered by most American authors to be a part of the genus *Alchemilla.* We are following Walter's treatment in the *Flora of the British Isles* (Clapham *et al.*, 1962, p. 394-402), in which he recognizes *Aphanes* as a distinct genus based on annual habit, one or rarely two stamens, and extrorse anthers. *Alchemilla* has a perennial habit, four to five stamens and introrse anthers. *Aphanes occidentalis* is apparently indigenous to North America but is closely related to a number of small-flowered European taxa. It is a weedy species that often rapidly invades disturbed habitats.

On the Queen Charlotte Islands it was only found near Queen Charlotte City, in the drier coastal regions bordering Skidegate Inlet. This station represents the northernmost record for this species along the Pacific coast, as it was previously known only from California to Vancouver Island. The occurrence of this dry, coastal-bluff species on the Islands is not surprising because a number of range extensions have been recorded for species previously known from only the southeastern region of Vancouver Island.

Aruncus

349. Aruncus sylvester Kostel., Ind. Hort. Prag. 15. 1844.
A. acuminatus (Dougl. ex Hook.) Rydb., N. Amer. Fl. 22: 255. 1908.

GRAHAM ISLAND: near Skidegate Village, *CST21424;* McClinton Bay, *CST21673;* between Ells and Mercer pts., *CST22894;* Dawson Inlet, *CTS35120;* Long Inlet, *CT35962;* Dawson Harbour, June 30, 1897, *Newcombe* (CAN); Skidegate, June 1895 and May 1901, *Newcombe* (V).

MORESBY ISLAND: Chaatl Narrows, *CST21740;* Sandspit, *CST21813;* Echo Harbour, *CST22322;* Takakia Lake, *CST23114;* Mt. de la Touche, *CT23521;* Crescent Inlet, *CTS34977;* head of Cumshewa Inlet, *CT35224;* Mt. Moresby, *CT36401.*

The taxonomic status of *Aruncus* in North America has been fully discussed by Fernald (1936) and we agree with his decision that the western plants should be recognized as a single species.

Aruncus sylvester occurs from sea level to tree line throughout the Queen Charlotte Ranges and on cliffs bordering Skidegate Inlet. Although it is primarily a lowland species restricted to open, rocky exposures near the coast, it occasionally extends into the subalpine zone along runnels and cliffs. A few plants were found growing on logs and tree stumps along streams in the lowland coniferous forest where light penetrates the canopy and competition is not severe.

Crataegus

Leaves deeply 3- to 7-lobed; stipules prominently foliaceous on new leaders; thorns 1–2 cm long but less than 2 mm wide at base ..... *C. monogyna*
Leaves never deeply lobed; stipules inconspicuous on new leaders; thorns 1–2 cm long but always more than 3 mm wide at base ..... *C. douglasii*

350. Crataegus douglasii Lindl., Bot. Reg. 21: *pl.*1810. 1835.
C. brevispina (Dougl.) A. Heller, Cat. N. Amer. Pl. ed. 2. 98. 1900.

GRAHAM ISLAND: 1 mi W of Queen Charlotte City, *CTS34796, CT35423, CT36952.*

The short-thorned *C. douglasii* is near its northern limit (Hyder, Alaska) on the Queen Charlotte Islands. A single tree, about 11 m high with a DBH of 20 cm, was found along the shoreline of Skidegate Inlet west of Queen Charlotte City. It flowered abundantly and produced many black fruits. This species was reported from Louise Island by Carter and Newcombe (1921, p. 49) based on an Osgoode collection. There is little doubt that *C. douglasii* should be found elsewhere along the drier eastern coasts of Graham and Moresby islands as many suitable habitats are available there.

351. *Crataegus monogyna Jacq., Fl. Austr. 3: 50. 1775.

GRAHAM ISLAND: Queen Charlotte City, *CT35848*, *CT35848A*.

Crataegus monogyna is a common cultivated tree on the Islands. In Queen Charlotte City a number of shrubs were noted as escapes on the shale banks along the shoreline of Skidegate Inlet. They are undoubtedly the progeny of a mature tree, 6 m high, in the grounds of a nearby hotel.

Fragaria

352. Fragaria chiloensis (L.) Duchesne, Hist. Nat. Frais. 165. 1766.

Hairs appressed on stems and petioles ..... ssp. *lucida*
Hairs spreading on stems and petioles ..... ssp. *pacifica*

352a. Fragaria chiloensis L. (Duchesne) ssp. **lucida** (E. Vilm.) Staudt, Can. J. Bot. 40: 883. 1962.

GRAHAM ISLAND: Tlell, *CST20889*, *CTS34639*, *CTS34654;* between Queen Charlotte City and Skidegate Village, *CST20927;* Skidegate, June 13 and July 10, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: between Sandspit and Cape Chroustcheff, *CST-20991;* Sandspit, *CST21106*.

352b. Fragaria chiloensis (L.) Duchesne ssp. **pacifica** Staudt., Can. J. Bot. 40: 883. 1962.

GRAHAM ISLAND: mouth of Sangan River, *CST21151;* Masset Spit, *CST21232;* Langara Island, *CST22566;* Skidegate, May 1901, *Newcombe* (V.)

MORESBY ISLAND: Hotspring Island, *CST22290A;* South Low Island, *CTS34840;* Low Island, *CTS35006;* Limestone Island, June 9, 1913, *Newcombe* (UBC, V); Kaisun, July 15, 1897, *Newcombe* (CAN).

Fragaria chiloensis consists of two sympatric races along the Pacific coast of North America (Staudt, 1962). Both races occur on the Queen Charlotte Islands

and can be distinguished by the type of vesture on the stems and petioles. Staudt (pers. comm.) has pointed out that there is some evidence in many of the populations that introgression of the cultivated *F. ananassa* nm. *cuneifolia* (Nutt. ex Howell) Staudt has taken place with the native populations. As examples of this introgression he cites our collection of ssp. *pacifica* from the spit at Haida (*CST21232*) and our collections of ssp. *lucida* (*CST21106*, *CST20991*, *CST-20889*, and *CST20927*). Staudt's discussion on the evolutionary development within *F. chiloensis* will be published in detail. We fully concur with Staudt's decisions regarding the distribution and relationships within *F. chiloensis*, but we are reluctant to recognize in the present flora the complex variants resulting from hybridization and introgression of the cultivated forms of *Fragaria* with the native populations.

Fragaria chiloensis is restricted to light sandy soils along the northern and eastern coasts of Graham and Moresby islands. Some colonies produced abundant fruit, but most were sterile. This species acts as a sand binder on some of the extensive coastal dunes near Tlell and along the coast east of Masset Spit.

Geum

Sepals reflexed in fruit; styles strongly geniculate and hooked at tip; petioles and base of stems conspicuously hirsute ..... *G. macrophyllum*

Sepals erect in fruit; styles straight, not hooked at tip; petioles and base of stems never conspicuously pubescent

Rosette leaves simple or lyrately pinnate, often appearing simple, with terminal leaflet reniform to orbicular, never deeply lobed; caudex woody, covered with scales that are rufescent pubescent ..... *G. calthifolium*

Rosette leaves lyrately pinnate with well-developed leaflets, terminal leaflet ovate, usually deeply 3-lobed; caudex woody, covered with coarse fibers.. *G. schofieldii*

353. Geum calthifolium Smith in Rees, Cycl. 16: No. 13. 1810.

GRAHAM ISLAND: Empire Anchorage, *CS21525;* Tan Mtn., *CST-21573;* between Ells and Mercer pts., *CST22895;* Newton Pt., *CST22952;* Shields Bay, *CT23310;* Jalun Lake, *CT35626, CT35671;* Dawson Inlet, Aug. 1961, *Foster & Bigg* (UBC).

MORESBY ISLAND: Chaatl Narrows, *CST21767;* Newcombe Peak, *CST21999;* Echo Harbour, *CST22318;* Takakia Lake, *CST23137*, *Foster & Joslin 46 & 55* (UBC); Mt. de la Touche, *CT23518;* Bigsby Inlet, *CTS34899;* Anna Inlet, *CTS34931;* Yatza Mtn., *CT35710;* Mt. Russ, *CT36168;* Mt. Moresby, *CT36430;* Sunday Inlet, *CT36610;* Buck Channel, June 12, 1952, *Brown* (V).

All collections of *G. calthifolium* from the Pacific Northwest that we have seen belong to the typical phase. The closely related var. *japonica* (Bolle) Ohwi occurs in Japan, and according to Hara (1952, p. 67) intermediates to var. *calthifolium* occur in Yezo, the Kuriles, and the Aleutian Islands.

Geum calthifolium is common along the coast of Alaska and northern British Columbia. Its southern limit on the mainland is in the mountains just north of Vancouver, and on Vancouver Island it is only known from two stations in Strathcona Provincial Park. In the Queen Charlotte Islands it occurs in the mountain ranges on wet rocky cliffs, on open boggy slopes, and around the margins of tarns. Although it was found in almost all the alpine and subalpine areas that we surveyed, most plants were sterile.

354. Geum macrophyllum Willd., Enum. Pl. Hort. Berol. 1: 557. 1809.

GRAHAM ISLAND: Tlell, *CST23251A;* Mamin River Delta, *T117;* Skidegate, May 1901, *Newcombe* (V).

MORESBY ISLAND: Sandspit, *CST21099; CT35352;* Alliford Bay, *CST21832;* head of Cumshewa Inlet, *CT36244.*

Geum macrophyllum is quite uniform along the Alaska and British Columbia coast and represents an eastern extension of this species from the type area in Kamchatka. It extends inland in British Columbia to the Rocky Mountains where it meets the interior continental *G. perincisum* Rydb. Intermediate types between these two species are found in the Prince George – Pine Pass region of northeastern British Columbia and southward along the Rocky Mountains to Wyoming and Colorado. Intermediate types also occur south of British Columbia in Idaho, Oregon, and Washington. These latter plants are probably the result of widespread hybridization and introgression south of the maximum advance of the Wisconsin ice sheet with a subsequent migration northward into southern British Columbia following the retreat of the glaciers. This large population of presumed hybrid origin undoubtedly represents the basis for the taxa *G. oregonense* Rydb. and *G. macrophyllum* var. *rydbergii* Farw.

We recognize the western coastal and far eastern North American populations as *G. macrophyllum*, whereas we believe the interior, essentially wide-ranging prairie populations should be maintained as a separate species *G. perincisum* Rydb. The latter species can be segregated from *G. macrophyllum* on the basis of good diagnostic morphological characters coupled with clear-cut geographic distributions.

All collections from the Queen Charlotte Islands, with the exception of a few plants from the sand delta of the Mamin River in Masset Inlet, were made on well-drained soils near the beaches along the eastern coast of Graham and Moresby islands.



Figures 148–149. *Geum schofieldii* Calder & Taylor. 148. Habit (× ½). 149. Mature achene (× 5½).

355. Geum schofieldii Calder & Taylor, Can. J. Bot. 43: 1394. 1965. **Figures 148–150.**

GRAHAM ISLAND: Tan Mtn., *CST21574;* Dawson Inlet, August 1961, *Foster & Bigg* (UBC).

MORESBY ISLAND: Mt. de la Touche, *CT23519;* Mt. Russ, *CT36144.*

Geum schofieldii is a striking endemic of the Queen Charlotte Islands. It belongs to the subgenus *Acomastylis* (Greene) Gajewski, which is characterized by long tubular hypanthia and straight styles that are glabrous or covered with short hairs. Gajewski (1957, p. 25) has further subdivided the subgenus into two sections, *Megacomastylis* (Bolle) Gajewski and *Micracomastylis* (Bolle) Gajewski. These two sections are separated on the basis of style length. In western North America, sect. *Megacomastylis* is represented by a single species, *G. calthifolium* Menzies, whereas, according to Gajewski, sect. *Micracomastylis* is represented by five species: *G. rossii* (R. Br.) Ser., *G. depressum* Greene, *G. gracilipes* Piper, *G. turbinatum* Rydb., and *G. sericeum* Greene. These five species have been recently included in a single species, *G. rossii*, by Hitchcock (*in* Hitchock *et al.*, 1961, p. 112). We are in full agreement with this latest taxonomic treatment. The position of *G. schofieldii* with respect to *G. rossii* and *G. calthifolium* is difficult to analyze and interpret. It appears to be intermediate between the two species, and this raises the question whether there is any real value in recognizing sections within the subgenus *Acomastylis. Geum schofieldii* can be readily distinguished from *G. rossii* and *G. calthifolium* by the following characters: basal leaves 10 to 30 cm long, blades interruptedly lyrate-pinnatifid, major leaflets 5 to 7, terminal leaflet entire or deeply 3-lobed or -cleft; mature achenes fusiform, 3 to 5 mm long, sericeous, styles persistent, straight, 7 to 10 mm long, glabrous, always much longer than achenes. For a full discussion of the morphological characteristics of *G. schofieldii* see Calder and Taylor (1965).

This endemic species is restricted to rocky runnels, cliff faces, or rock outcrops from about 1,500 to 2,000 ft in the main mass of the Queen Charlotte Ranges. It is frequently associated with *Lloydia serotina* ssp. *flava* Calder and Taylor, *Saxifraga oppositifolia* L., *Isopyrum savilei* Calder and Taylor, *Geum calthifolium* (R.Br.) Ser., *Viola biflora* ssp. *carlottae* Calder and Taylor and *Carex circinata* C. A. Meyer. *Geum schofieldii* is a perennial with attractive foliage and flowers. It has been successfully grown in our greenhouse and would be a valuable addition to a rock garden.

Luetkea

356. Luetkea pectinata (Pursh) Kuntze, Rev. Gen. 217. 1891.

Saxifraga pectinata Pursh, Fl. Amer. Sept. 312. 1814; *Spiraea pectinata* T. & G., Fl. N. Amer. 1: 417. 1840.

GRAHAM ISLAND: Empire Anchorage, *CS21476;* Newton Pt., *CST-*



Figure 150. *Geum schofieldii* Calder & Taylor with *Carex macrochaeta* C. A. Meyer on cliff ledges in a north-facing rock runnel at about 1,600 feet on Mount Russ near Kootenay Inlet on west side of Moresby Island.

22958; Shields Bay, *CT23284, CT23370;* between Ells and Mercer pts., *CST-23844;* Dawson Inlet, *CTS35103.*

MORESBY ISLAND: Chaatl Narrows, *CST21791;* Newcombe Peak, *CST22004;* Bigsby Inlet, *CST22140, CTS34897;* Echo Harbour, *CST22349;* Takakia Lake, *CST23096;* Mt. de la Touche, *CT23517;* Mosquito Mtn., *CT23748,* Anna Inlet, *CTS34987;* Upper Victoria Lake, *CT35726;* Mt. Carlotta, *CT36186;* Mt. Moresby, *CT37017,* July 13, 1961, *Foster & Bigg* (UBC).

Luetkea pectinata is a common subalpine or alpine species of rocky exposures throughout the Queen Charlotte Ranges. It also occurs with a number of alpine species on open, windswept bluffs and cliffs near sea level on the exposed outer coast. In 1957 it was collected in full flower on June 13 a short distance back from the shoreline at Empire Anchorage, and in late August it was still flowering profusely above tree line on Mosquito Mountain.

Luetkea pectinata is a beautiful plant when it grows en masse carpeting boulders and rocky ground. In the Queen Charlotte Islands the flowers are usually pinkish white, and as with many other species from these Islands the vegetative parts of the plants are often strongly pigmented with anthocyanin. We have collected *Luetkea* many times in Alaska and elsewhere in British Columbia and in all cases the flowers were pure white.

Flowers purple; leaves 5- to 7-pinnate and never anisophyllous, lower surface sparsely pubescent, light green; bogs and marshes ..... *P. palustris*

Flowers pale cream or yellow; leaves either trifoliolate, or 15- to 29-pinnate and anisophyllous, lower surface densely pubescent, silvery

Leaves pinnate, anisophyllous, never villous beneath; strongly stoloniferous; meadows or sand beaches.. *P. pacifica*

Leaves trifoliolate, densely villous beneath; never stoloniferous; rocky bluffs or headlands ..... *P. villosa*

357. Potentilla pacifica Howell, Fl. NW. Amer. 1: 179. 1898.
P. anserina sensu Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 49: 1921.

GRAHAM ISLAND: 4½ mi E of Masset, *CST21135;* Yakan Pt., *CST-21310;* Tlell, *CST21367;* Yakoun River Delta, *CT35471;* Masset Spit, *CT35703;* near mouth of Oeanda River, *CT35899.*

MORESBY ISLAND: Sandspit, *CST21107;* Chaatl Narrows, *CST21793;* Copper Bay, *CST21881;* Mike Inlet, *CT36661;* Ninstints, June 1901, *Newcombe* (V).

The taxonomic relationship between the essentially coastal *P. pacifica* and the inland *P. anserina* L. has never been thoroughly investigated, but it has been suggested by Hultén (1946, p. 1011) and Dr. A. Rousi of Turku (pers. comm.) that *P. pacifica*, as well as *P. egedii* Wormskj. and *P. yukonensis* Hult., represent no more than races of *P. anserina*. After an examination and a comparison of our material from the Pacific Northwest with other North American and European material, we are in agreement with the suggestions of these two authors. However, it is beyond the scope of this flora to complete a review of the world-wide *P. anserina* complex and we would be amiss in establishing a new combination for the Pacific coast population.

One of the characters used by Munz (1959) in distinguishing *P. pacifica* (= *P. egedii* var. *grandis* (Rydb.) J. T. Howell) from *P. anserina* is the erect versus spreading basal leaves respectively. Our collections from pastures or exposed rocky bluffs have spreading basal leaves, whereas those growing in sedge meadows have erect leaves. Clearly the character of leaf habit is modified by the environment and is of little diagnostic significance in separating the two species (races). A single collection from the Sandspit region possesses trifid bracts and could be identified as *P. anserina* if one uses Hultén's key, but these plants differ in no other way from the rest of the collections from the Islands and are best considered as part of *P. pacifica.*

This species is a widely distributed and common coastal plant of the Queen Charlotte Islands.

358. Potentilla palustris (L.) Scop., Fl. Carn. 1: 359. 1772.

GRAHAM ISLAND: Yakan Pt., *CST22728*, *CT36815;* about 3 mi E of Masset, *CST22762*.

MORESBY ISLAND: Red Mud Marsh, *CST23202*, *CT36723;* White Swan Bog, *CT23663;* Skidegate Lake, *CT35148*.

Potentilla palustris occurs sporadically throughout the eastern and northeastern lowlands of Graham and Moresby islands respectively, but it is never a conspicuous element of the flora. It is often associated with bog pools and reaches its best development in open sedge meadows near the coast. Few flowering or fruiting plants were noted.

359. Potentilla villosa Pallas ex Pursh, Fl. Amer. Sept. 353. 1814. **Figure 151.**
P. fragiformis var. *villosa* (Pallas ex Pursh) Regel & Tiling, Fl. Ajan. 85. 1858.
P. villosa var. *chrysocoma* Rydb., Mem. Dept. Bot. Columbia Univ. 2: 88. 1898.
P. villosa var. *parviflora* C.L. Hitchc., Vasc. Pl. Pacif. NW. 3: 156. 1961.

GRAHAM ISLAND: Haida Pt., *CST20869;* Empire Anchorage, *CS21446;* Langara Island, *CST22538*, June 13, 1956, *Widdowson* (UBC); Newton Pt., *CST22942;* Torrens Island, *CT35821;* Dawson Harbour, June 24, 1897, *Newcombe* (CAN, V); Pillar Pt., June 1913, *Newcombe* (V); Skidegate, June 2, 1910, *Spreadborough* (CAN).

Figure 151. *Potentilla villosa* Pallas ex Pursh on rock bluffs near shoreline at Image Point, Skidegate Inlet, Graham Island.



MORESBY ISLAND: near Alliford Bay, *CST21047;* head of Cumshewa Inlet, *CST21979;* islet off Bolkus Islands, *CST22240;* Hotspring Island, *CST22279;* Tuft Islets, *CTS34863*, *Foster & Joslin 76A* (UBC); Low Island, *CTS35003;* Dass Pt., *CTS35016;* Mt. Moresby, *CT36412;* Mosquito Mtn., *CT36480;* Kaisun, *CT36552;* Sunday Inlet, *CT36586;* Horn Rock, Aug. 10, 1957, *Mills;* Limestone Island, May 1901, *Newcombe* (V); Tar Islands, *Foster & Joslin 74, 79* (UBC).

Potentilla villosa is extremely uniform along the entire British Columbia – Alaska coast, but east of the crest of the Coast Mountains, where it occurs in alpine or subalpine habitats, there is considerable variation between the populations in the different mountain ranges. Henry (1915) recorded this species from the Rocky and Cascade mountains and Hultén (1946, p. 1032) has indicated that it is possibly present in the Selkirk Mountains. We have seen collections from two of these areas and they differ from those at the coast in *usually* having smaller, less coriaceous leaves with a thinner tomentum beneath, narrower leaflets, and flowers as small as those of *P. vahliana* Lehm. Plants with a pronounced yellowish pubescence were described by Rydberg as var. *chrysocoma*, but this distinguishing character appears to have no taxonomic significance as the pubescence varies in color from white to yellow throughout the range of the species. The var. *parviflora* recently described by Hitchcock has been included in the synonymy as there are no sound phytogeographical or morphological grounds for recognizing this taxon as distinct.

The arctic—alpine species of *Potentilla* in the Pacific Northwest form a complex group. As has been pointed out by Clausen, Keck, and Hiesey (1939), many species have cytological irregularities and these irregularities are presumably associated with apomixis. If this is the case in *P. villosa*, one might expect to find a number of phenotypes in an area of varied topography, where plants are found from sea level to alpine summits, and from a wet coastal belt to a relatively dry interior. A detailed comparison should be made between the coastal and inland populations before any further taxonomic considerations are proposed.

In the Charlottes *P. villosa* is essentially a coastal species found on rocky bluffs and cliffs at sea level. It does not occur on sand or gravel beaches and consequently was not found along the eastern and northeastern coasts of Graham Island. Two sterile collections were made on Mount Moresby, one on the gravelly margins of a steep north-facing runnel at about 1,000 ft and the second from an open rocky ridge at about 3,000 ft. Both these collections are provisionally identified as *P. villosa.*

Pyrus

360. Pyrus fusca Raf., Med. Fl. 2: 254. 1830.
P. diversifolia Bong., Mém. Acad. St. Pétersb. VI. 2: 133. 1832.
Malus fusca (Raf.) C. K. Schneid., Handb. Laubh. 1: 723. 1906.

GRAHAM ISLAND: between Tow Hill and Rose Spit, *CST21212;* about 2½ mi E of Masset, *CST21296;* Tlell, *CST21364*, *CST23169;* 1½, 5 and 5½ mi

SE of Port Clements, *CST21386*, *CST23468* (DAOM), *CTS34592;* near Skidegate Village, *CST21415;* Empire Anchorage, *CS21448*, *CS21528* (DAOM); Yakoun River Delta, *CTS21555;* Queen Charlotte City, *CST23031;* about 10 mi SSE of Juskatla, *T4;* near Juskatla, *S3550;* Jalun Lake, *CT35615;* Yakoun Lake, *CT36785;* Juskatla, June 10, 1952, *Schmidt;* Dawson Harbour, June 24, 1897, *Newcombe* (CAN, V); Honna River, July 5, 1952, *Pillsbury* (UBC); Skidegate, June 1897 and May 20, 1901, *Newcombe* (V); Queen Charlotte City to Skidegate, June 1, 1951, *Cowan* (UBC).

MORESBY ISLAND: Mosquito Lake, *CST21024;* Sandspit, CST21112; Bag Harbour, *CST22188* (DAOM); Harriet Harbour, *CST22265;* South Low Island, *CTS34854;* Dass Pt., *CTS35017;* Ninstints, June 13, 1913, *Newcombe* (V); Church Creek, June 16, 1952, *Pillsbury* (UBC, V); Little Goose Bay, Sept. 10, 1951, *Pillsbury* (UBC).

Pyrus fusca, the wild crab apple of the Pacific coast, is found throughout the Islands and is especially common along the upper limits of sea beaches and in open wooded areas in the lowlands of eastern Graham and Moresby islands. A number of trees were seen inland along the many sluggish flowering streams (*see* Figure 60), on margins of such lakes as Jalun, Yakoun, Mayer, and Upper Victoria, and around the margins of Masset and other inlets. This species may reach a height of 6 m but never forms dense stands. Its leaves, which turn red or yellow in the fall, add some color to an otherwise drab landscape, where the only other deciduous trees are three species of willow.

Rosa

361. Rosa nutkana Presl, Epim. Bot. 203. 1852.

GRAHAM ISLAND: between Skidegate and Skidegate Village, *CST21411;* Tlell, *CST21802;* Skidegate, *CST22450*, May 1901, *Newcombe* (V), June 30 and Aug. 2, 1910, *Spreadborough* (CAN); Langara Island, *CST22569;* Queen Charlotte City, *CST23015;* Naden Harbour, *CT36846;* 2½ mi S of Tlell, *CT36883.*

MORESBY ISLAND: Sandspit, *CST21843*, *Foster & Joslin 34* (UBC); Bag Harbour, *CST22184;* Hotspring Island, *CST22304;* mouth of Deena River, *CT23790;* Little Goose Bay, Sept. 10, 1951, *Pillsbury* (UBC); Kaisun, July 13, 1897, *Newcombe* (CAN).

In a recent treatment of *Rosa* by Cronquist (*in* Hitchcock *et al.*, 1961) two "wholly intergradient" varieties are recognized. We have been unable to critically evaluate the status of these two doubtfully distinct varieties and refer plants from the Islands to *R. nutkana* in the broad sense.

This species is remarkably uniform on the Queen Charlottes. The young canes are usually unarmed, in contrast to the stout-stemmed older canes which have large, prominent, infrastipular prickles. Some shrubs on open rock bluffs along the southwest shore of Langara Island have canes up to 5 cm in diameter.

It is a common species in clearings and along forest margins on both the eastern and northern coasts, but on the west coast it has been collected at only one site, Kaisun.

Rubus

Plants usually less than 15 cm high, essentially herbaceous or with weak woody prostrate canes
- Stems armed with prickles ..... *R. ursinus*
- Stems unarmed
  - Flowers unisexual; leaves simple, round reniform, essentially 5-lobed; sphagnum bogs ..... *R. chamaemorus*
  - Flowers bisexual; leaves compound, pedately 3-foliolate; coniferous woods ..... *R. pedatus*

Plants usually over 1 m high, woody with upright or arching canes
- Leaves simple ..... *R. parviflorus*
- Leaves compound
  - Leaflets laciniately lobed to divided into secondary leaflets; flowers pinkish white ..... *R. laciniatus*
  - Leaflets never laciniately lobed; flowers white or red
    - Flowers white; drupelets coherent with the fleshy receptacle; leaflets grayish tomentose beneath, berries black ..... *R. procerus*
    - Flowers red; drupelets separating from the semi-fleshy receptacle; leaflets sparsely pubescent beneath; berries yellow or red ..... *R. spectabilis*

362. Rubus chamaemorus L., Sp. Pl. 1: 494. 1753.

GRAHAM ISLAND: about 4½ mi NW of Tlell, *CST20951;* near Tow Hill, *CST21157*, *CST22706;* 7 and 12 mi N of Port Clements, *CTS34700*, *CTS34715;* N of Queen Charlotte City, July 5, 1952, *Schmidt;* Tlell, May 27, 1951, *Cowan* (UBC); Masset, July 1901, *Newcombe* (V).

Rubus chamaemorus appears to be restricted to the extensive series of intermittent sphagnum bogs that occur throughout the low-lying sections of eastern Graham and northeastern Moresby islands. It is locally common in the muskeg between Tow Hill and Rose Spit and was collected in a number of roadside bogs between Masset and Tlell. In 1957 this species was observed, but not collected, near the Yakoun River south of Juskatla and in White Swan Bog a few miles north of Moresby Logging Camp. The many small bogs on the open, wet slopes of the Queen Charlotte Ranges are apparently not suitable habitats for *R. chamaemorus*. On the Islands this species rarely flowers or produces fruit.

363. *Rubus laciniatus Willd., Hort. Berol. 2: *pl.* 82. 1806.

GRAHAM ISLAND: Skidegate Village, *CT36953.*

This attractive pink-flowered blackberry has escaped into the woods and along the upper part of the shingle beach at Skidegate Village. This species was not observed at any other settlements on the Islands.

364. Rubus parviflorus Nutt., Gen. N. Amer. Pl. 1: 308. 1818.

GRAHAM ISLAND: about 2½ mi S of Tlell, *CST21339;* Tlell, *CST21804;* near Skidegate Village, *CST21432;* McClinton Bay, *CST21664;* near Masset Spit, *CST22789;* Queen Charlotte City, *CST23012* (DAOM), *CST23040* (DAOM); Image Pt., *CTS34685;* Honna River, *CT35413;* 6 mi S of Juskatla, *CT35491;* Long Inlet, *CT35987;* Skidegate, July 6, 1897 and June 1901, *Newcombe* (V).

MORESBY ISLAND: Sandspit, *CST21100;* near Copper Bay, *CST21927;* Limestone Island, *CST22420, CTS34809;* between Copper Bay and Skidegate Lake, *CT23674;* Kaisun, *CT36567;* Kitgoro, June 30, 1897, *Newcombe* (CAN).

The variation in *R. parviflorus* and its distribution have been fully discussed by Fernald (1935*a*) and Fassett (1941). Fernald recognized eight varieties essentially on the basis of variation in the pubescence of the leaves, pedicels and calyx lobes. In contrast, Fassett recognized only two, var. *parviflorus* and var. *velutinus* (H. & A.) Greene, but attributed to them a total of 19 forms. Many varieties and forms recognized by these authors are found within the geographically isolated population around the Upper Great Lakes as well as throughout the entire western distribution of the species. Fassett points out that he assigned taxonomic status to the variations in pubescence in order: to facilitate discussion of the different phases, to discuss the significance of the occurrence of each, and to eventually distribute material illustrative of them. Clearly these are not valid reasons for proposing new formal categories and describing a number of new forms. It is unfortunate that he has added to the taxonomic confusion of this species.

We have compared coastal British Columbia and Upper Great Lakes material and can find no apparent differences between the two populations. We consider the Island material to belong to ssp. *parviflorus* and recognize that one or possibly two other subspecies occur in western North America. Hitchcock (*in* Hitchcock *et al.*, 1961) considers that only two varieties, var. *parviflorus* and var. *velutinus*, occur in the geographical area covered by his Pacific Northwest flora. *Rubus parviflorus* var. *velutinus* is distinguished from the typical phase by the presence of long, spreading hairs on the stems, stipules, and petioles, and the lower surfaces of the leaves are always densely, velvety pubescent.

Rubus parviflorus forms a very uniform population in the Queen Charlotte Islands and on the adjacent mainland. All collections have the lower surfaces of the leaves, pedicels, and calyx lobes glandular-pubescent, with short- to long-

stipitate, glandular hairs. The upper surfaces of the leaves are sparsely pubescent. This species is a common shrub in clearings and along the margins of woods, especially in the eastern sections of Moresby and Graham islands and around the border of Masset Inlet. There are records from the abandoned Haida villages of Kaisun and Kitgoro on the west coast. The only collection from the Queen Charlotte Ranges was made along the rock walls of a ravine at about 1,200 ft above Long Inlet at the head of Skidegate Inlet.

365. Rubus pedatus Smith, Pl. Icon. Ined. *pl.* 63. 1791.

GRAHAM ISLAND: near Masset, *CST20856* (DAOM); near Tow Hill, *CST21201;* Yakoun River Delta, *CST21559;* near Skidegate, *CST21702;* near Masset Spit, *CST22787;* Shields Bay, *CT23378;* about 4 and 10 mi SSE of Juskatla, *T83*, *T5;* Blackwater Creek, *T48;* 5 mi N of Port Clements, *CTS34695;* Dawson Inlet, *CTS35127;* Dawson Harbour, May 1901 and June 26, 1897, *Newcombe* (CAN).

MORESBY ISLAND: about 3 mi S of mouth of Copper Creek, *CST21889;* Mt. de la Touche, *CT23592;* between head of Cumshewa and Peel inlets, *CT35199;* Takakia Lake, *CT36359;* Little Goose Bay, Sept. 10, 1951, *Pillsbury* (UBC – in part); Ikeda Bay, June 10, 1913, *Newcombe* (UBC).

Rubus pedatus was described by Bailey (1941, p. 40) in his treatment of the North American *Rubi* as having leaves which are glabrous above and sparsely short-hairy on the ribs underneath. The leaves of nearly all the plants in the collections that we have cited and a number of others which we have examined from coastal Alaska and British Columbia are sparsely to moderately hirsute on both surfaces, especially along the midribs and veins. Leaves of plants from east of the Coast Mountains are essentially glabrous above, and glabrous to sparsely hirsute on the veins beneath. As occasional specimens of the two types occur outside their main ranges it does not seem practical to formally recognize these minor races. It should be pointed out that the calyx lobes are often entire (not always toothed as stated by Bailey) and that both surfaces of the leaves are glandular-pubescent along the midribs and veins.

Rubus pedatus is predominantly a species of the dense hemlock–spruce forest of the lowlands, where it often forms large mats, but rarely produces abundant fruit. It occurs on open-wooded, rocky slopes of the Queen Charlotte Ranges and was collected well above tree line along the margin of a runnel on the slopes of Mount de la Touche and on an open stabilized talus slope above Takakia Lake.

366. *Rubus procerus P. J. Mueller ex Boulay, Ronces Vosgr. 6: 7. 1864.
R. thyrsanthus sensu Eastham, Suppl. Fl. South. B.C. 69. 1947.

GRAHAM ISLAND: Queen Charlotte City, *CST23018*, *CT36946;* Port Clements, *CT36114.*

MORESBY ISLAND: Sandspit, *CT23680.*

This species was probably introduced into the Islands many years ago as it is well established along roadsides at Sandspit and Queen Charlotte City, and was noted in similar habitats at Port Clements and Masset. As an escape it is only known west of the Coast Mountains, in the Fraser River valley, and on Vancouver Island, but it probably occurs at many of the small settlements along the mainland coast north of Vancouver.

367. Rubus spectabilis Pursh, Fl. Amer. Sept. 348. 1814.

GRAHAM ISLAND: Masset, *CST20859;* Queen Charlotte City, *CST20907*, *CST23009* (DAOM), *CST23022* (DAOM); near Tow Hill, *CST21202;* Empire Anchorage, *CS21489;* Tlell, *CST22103;* Langara Island, *CST22552;* Dawson Inlet, *CST22936*, *CTS35118;* Blackwater Creek, *T43;* 9 mi S of Juskatla, *T75;* Masset Spit, *CT35700;* between Skidegate and Skidegate Village, *CT35839;* Long Inlet, *CT35986;* Dawson Harbour, June 26, 1897, *Newcombe* (CAN); Skidegate, April 29, 1901, *Newcombe* (V).

MORESBY ISLAND: head of Cumshewa Inlet, *CST20955*, *CST21960;* Alliford Bay, *CST21059;* Sandspit, *CST21105;* between Harriet Harbour and Huston Inet, *CST22243;* Takakia Lake, *CST23119;* Mt. de la Touche, *CT23520;* Sunday Inlet, *CT36621;* Skedans, May 1901, *Newcombe* (V); Lockeport, May 22, 1923, *Newcombe* (V).

Rubus spectabilis is a common bramble of forest clearings, stream banks in coniferous woods, logged-over areas, and open habitats especially near the coast. Although essentially a lowland species it is found in rocky runnels to treeline in the Queen Charlotte Ranges. The upright or slightly arching canes occasionally reach a height of 3 m and produce abundant red to yellowish fruit. Bailey (1945, p. 897) has stated that the color of the twigs indicates the color of the fruit. This is certainly not so in the British Columbia and Alaska material that we have seen as the twigs vary in color from yellowish to yellowish brown in both red- and yellow-fruited collections.

Rubus spectabilis is widely distributed west of the crest of the Coast Mountains in British Columbia. Its only eastward penetration has been in the Skeena River drainage, where it has reached Smithers (Glacier Gulch, July 29, 1946, *Eastham, Calder et al. 12897*) on the eastern flank of the mountains at 55° N.

368. Rubus ursinus Cham. & Schlecht., Linnaea 2: 11. 1827.

MORESBY ISLAND: [Houston Stewart Channel,] June 15, 1878, *Dawson* (CAN).

Rubus ursinus is essentially restricted to the southern half of Vancouver Island and the adjacent mainland in British Columbia. Dawson's record from the southern tip of Moresby Island would represent a considerable range extension. As there have been several mistakes made in the original labeling of Dawson's collections, the record from the Queen Charlotte Islands should be considered a provisional one until it can be substantiated by a new collection.

Calyx greenish white, but always with some sepals reddish tinged; filaments 3 to 4 times as long as the sepals; spikes 4–8 cm long ..... *S. canadensis*

Calyx reddish purple; filaments only slightly longer to about 3 times as long as the sepals; spikes 1–4 cm long

Filaments only slightly longer than the sepals, flattened, clavate ..... *S. officinalis*

Filaments 2 to 3 times as long as the sepals, terete ... *S. menziesii*

369. Sanguisorba canadensis L. ssp. **latifolia** (Hook.) Calder & Taylor, Can. J. Bot. 43: 1395. 1965.

S. canadensis var. *latifolia* Hook., Fl. Bor.-Am. 1: 198. 1832; *S. latifolia* (Hook.) Coville, Contr. U.S. Nat. Herb. 3: 339. 1896.

S. stipulata Raf., Herb. Raf. 47. 1833.

S. sitchensis C. A. Meyer in Trautv. & Meyer, Fl. Ochot. 34. 1856; *S. canadensis* var. *sitchensis* (C. A. Meyer) Koidzumi, Bot. Mag. Tokyo 31: 137. 1917.

GRAHAM ISLAND: Long Inlet, *CT35958*.

MORESBY ISLAND: Mt. de la Touche, *CT23559* (DAOM), *CT23613;* Mt. Russ, *CT36147;* Takakia Lake, *CT36318;* Mt. Moresby, *CT36436*.

Most authors have continued to treat the perennial white-spiked *Sanguisorba* of western North America as a species under the long-familiar name *S. sitchensis*, in spite of the fact that in 1946 Fernald resurrected an earlier Rafinesque name *S. stipulata* that could only apply to this species. However, the western plant is obviously closely related to *S. canadensis* of eastern North America, and after examining about 150 collections from the two areas we do not believe they should be regarded as distinct species, but agree with Hooker, who, in his *Flora Boreali-Americana*, considered the western plant to be a race of *S. canadensis* L.

In ssp. *canadensis* the leaflets are narrowly oblong to oblong-ovate or ovate and 2 to 3 times as long as broad, and the sepals are greenish white with midribs that are thickened at the apex. The leaflets of the western ssp. *latifolia* are ovate or broadly ovate and less than twice as long as broad, and some of the greenish-white sepals are slightly reddish or purplish-tinged and have midribs that are not thickened. We can find no other consistent differences between the two subspecies. Occasional plants of ssp. *canadensis* have leaflets like those of the western race but the sepal differences remain constant. We have seen one western collection (about Lake Waha, Nez Perces Co., Idaho, *Heller & Heller 3391*) that we could not distinguish from the eastern race.

Along the British Columbia – Alaska coast and in interior Alaska reddish-tinged sepals are occasionally conspicuous on specimens of *S. canadensis* ssp. *latifolia* and this strongly suggests introgression with the coastal *S. officinalis* ssp. *microcephala* (Presl) Calder & Taylor and the more northern inland *S. officinalis* L. ssp. *officinalis*. *Sanguisorba canadensis* ssp. *latifolia* does not occur east of the Coast Mountains in the southern part of British Columbia but at

about 53° N it extends inland to the west flank of the Rocky Mountains and its distribution pattern strongly suggests an eastward post-Wisconsin migration from the coast through the Skeena River drainage. Such a migration is also postulated for *Heuchera chlorantha* Piper and *Fritillaria camschatcensis* (L.) Ker-Gawl. The reddish tinge of the sepals of *S. canadensis* ssp. *latifolia* is not as pronounced in plants from the interior of British Columbia as it is in plants from the coast, but this color difference supports the hypothesis of an eastward post-Wisconsin migration of plants.

Sanguisorba canadensis ssp. *latifolia* is a rare plant on the Queen Charlotte Islands. It is essentially an alpine or subalpine subspecies of cliffs and rocky exposures of the Queen Charlotte Ranges, but occasionally it is found almost at sea level in protected ravines. The few records are from the main mountain mass between Long Inlet and Mount de la Touche. Apparently this species, like *S. officinalis* ssp. *microcephala,* rarely flowers profusely. It appears that both these species of *Sanguisorba* are at the limit of their environmental tolerance on the Islands.

370. Sanguisorba menziesii Rydb., N. Amer. Fl. 22: 387. 1908.

GRAHAM ISLAND: Tennants Lake, Skidegate, 1897, *Newcombe* (V).

Sanguisorba menziesii has in all probability developed from hybridization between ancestral types similar to the white-flowered *S. canadensis* ssp. *latifolia* (Hook.) Calder & Taylor and the red-flowered *S. officinalis*. Such a hypothesis seems reasonable when a comparison based on morphology is made between *S. menziesii* and the other two species. *Sanguisorba menziesii* extends sporadically from the Kenai Peninsula in the Gulf of Alaska southward along the Alaska – British Columbia coast to the Olympic Peninsula of Washington. Part of its range overlaps that of *S. officinalis* ssp. *microcephala,* but where they are found in the same general region they appear to be isolated both altitudinally and ecologically. The distribution patterns of the three species of *Sanguisorba* that occur on the Queen Charlotte Islands are discussed in the Introduction.

The Newcombe record from the Charlottes is probably from one of the two small lakes about a mile directly north of Skidegate. We surveyed one of these lakes in 1957 and although there are suitable habitats for this species along its boggy shoreline we did not find any plants.

371. Sanguisorba officinalis L. ssp. **microcephala** (Presl) Calder & Taylor, Can. J. Bot. 43: 1395. 1965.
S. microcephala Presl, Epim. Bot. 202. 1852.

GRAHAM ISLAND: near Tow Hill, *CST22708;* about 10 and 15 mi S of Masset, *CST22815, CT35565;* Shields Bay, *CT23334;* about 5 mi SE of Port Clements, *CST23484;* Masset, July 1914 and Sept. 25, 1912, *Green* (UBC).

MORESBY ISLAND: Red Mud Marsh, *CST23187;* near head of Cumshewa Inlet, *CT23664;* Mike Inlet, *CT36674.*

There is a diversity of opinion as to whether Presl's *S. microcephala* of the Pacific coast should be considered a distinct taxon or a variant of the polymorphic *S. officinalis* L. In our view its recognition is fully justified on both morphological and phytogeographical grounds. *Sanguisorba microcephala* is obviously closely related to *S. officinalis*, which occurs in central Alaska and Yukon, but we consider it to be a distinct race of this species. The typical phase and ssp. *microcephala* can readily be distinguished as follows:

Leaves serrate, the teeth triangular to mammiform and usually prominently apiculate, apex acute to rounded, base usually truncate but occasionally attenuate or cordate; length to width ratio of longest leaves 1.5–2.7(–4.7):1; plants of meadows, thickets, and open sandy soil ..... ssp. *officinalis*

Leaves serrate, the teeth usually mammiform and weakly apiculate, apex rounded, base usually conspicuously cordate; length to width ratio of longest leaves 1.3–1.5(–1.8):1; plants of sphagnum bogs ..... ssp. *microcephala*

Sanguisorba officinalis ssp. *officinalis* extends from the dry interior valleys of western Yukon through central Alaska to Bering Strait and is restricted to an area which entirely escaped glaciation during the Pleistocene. In contrast, ssp. *microcephala* is at or near the northern limit of its range in the Queen Charlotte Islands, from where it extends southward in coastal sphagnum bogs to northwestern California. We have not seen any of the collections from the Alaska panhandle cited by Hultén under *S. menziesii* Rydb., but suspect that some should be referred to ssp. *microcephala*. The allopatric ssp. *officinalis* and ssp. *microcephala* are separated by well over 600 miles and it is in this gap that *S. menziesii* is found in bogs and marshes. This latter species is in all probability of hybrid origin between *S. canadensis* ssp. *latifolia* (Hook.) Calder & Taylor and *S. officinalis* ssp. *microcephala*.

Subspecies *microcephala* is found throughout the lowlands of the Queen Charlotte Islands in bogs and marshes, especially around the margins of small pools. It occurs in similar habitats in the Queen Charlotte Ranges from sea level to tree line. This *Sanguisorba* rarely flowers profusely on the Charlottes and is never a conspicuous element of the vegetation.

Sibbaldia

372. Sibbaldia procumbens L., Sp. Pl. 1: 284. 1753.

MORESBY ISLAND: Mt. Moresby, *CT36375;* Mosquito Mtn., *CT36446*.

The circumpolar *S. procumbens* is one of the most common subalpine or alpine plants throughout the Cordilleran region of North America. On the Queen Charlotte Islands it was collected only in the center of the highest mountain mass on the Islands. It was locally common on open north-facing rocky heaths from 2,400 to 2,900 ft above Mosquito Lake, and a single sterile plant was found in a rocky runnel at about 500 ft below the north face of the mountain.

SORBUS

Young twigs, pedicels and winter buds white villous; lower surface of the leaves whitish pubescent ..... *S. aucuparia*
Young twigs, pedicels and winter buds ferrugineous-pilose; lower surface of the leaves glabrous or pubescent only along the midveins ..... *S. sitchensis*

373. *Sorbus aucuparia L., Sp. Pl. 1: 477. 1753.

GRAHAM ISLAND: outskirts of Port Clements, *CST23492;* Masset *CT36831;* Image Pt., *CT36962.*

Sorbus aucuparia, the widely cultivated European mountain ash, occurs as a sporadic garden escape in Canada. On the Queen Charlotte Islands, it was noted as an escape along roadsides at Masset and in open woods at Image Point, Skidegate. A single tree was observed growing on a rotten coniferous stump on the outskirts of Port Clements.

374. Sorbus sitchensis M. Roemer, Fam. Nat. Syn. 3: 139. 1847.

Leaflets oblong to elliptic-ovate, rounded or truncate at the apex, almost entire to conspicuously toothed (about 4–16 teeth) from the apex to near the middle. ssp. *grayi*
Leaflets elliptic to occasionally oblong, acute to rounded at the apex, conspicuously toothed (about 16–40 teeth) from the apex to half or about four fifths their length ..... ssp. *sitchensis*

374a. Sorbus sitchensis M. Roemer ssp. **sitchensis**

GRAHAM ISLAND: McClinton Bay, *CST21636;* Blackwater Creek, *T44;* N of Queen Charlotte City, July 5, 1952, *Schmidt;* Dawson Harbour, June 24, 1897, *Newcombe* (CAN, V).

MORESBY ISLAND: Bigsby Inlet, *CTS34895;* Mosquito Mtn., *CT37015.*

374b. Sorbus sitchensis M. Roemer ssp. **grayi** (Wenzig) Calder & Taylor, Can. J. Bot. 43: 1395. 1965.
S. sambucifolia var. *grayi* Wenzig, Bot. Centralbl. 35: 342. 1888.
S. occidentalis (S. Wats.) Greene, Pittonia 4: 131. 1900.
S. sitchensis var. *grayi* (Wenzig) C.L. Hitchc., Vasc. Pl. Pacif. NW. 3: 189. 1961.

MORESBY ISLAND: Takakia Lake, *CST23064, CT36321;* Mt. Moresby, *CT36467.*

Sorbus, like a number of other woody rosaceous genera in the boreal zone of North America, is a plastic genus comprised mainly of poorly defined taxa that show extensive introgression where their ranges meet or overlap. We are unable

to accept the treatment by Jones (1939), in which five species are recognized in western Canada and Alaska. *Sorbus alaskana* Jones falls well within the normal range of variation of *S. scopulina* Greene, which in turn is very closely related to or part of the *S. americana* Marsh. – *S. decora* (Sarg.) Schneider complex of eastern North America. *Sorbus cascadensis* Jones (= *S. scopulina* var. *cascadensis* (Jones) C. L. Hitchc.), which extends south to California from the Cascade Mountains of British Columbia, is also part of this complex and, according to Hitchcock (*in* Hitchcock *et al.*, 1961), often intergrades with *S. scopulina*. The other two species recognized by Jones are *S. sitchensis* and *S. occidentalis*. In the north the former is restricted to the coastal regions of Alaska, but south of 54°N it is widely distributed throughout central British Columbia and extends to Waterton Lakes National Park on the east flank of the Rocky Mountains in Alberta. In the southern interior of British Columbia *S. sitchensis* is essentially a subalpine species whereas *S. scopulina* usually occurs at lower elevations. We have seen a few collections that appear to be hybrids between these two species. The collections of *S. occidentalis* that we have examined are all from west of the crest of the Coast and Cascades mountains with the exception of one from Sylvan Mine (*Calder et al. 14652*) near Smithers. As intermediates between *S. occidentalis* and *S. sitchensis* occasionally occur in the coastal region and as the two taxa differ only in the serration and to some degree in the shape of the leaflets, Hitchcock's recent treatment of *S. occidentalis* as ssp. *grayi* seems fully justified.

Both ssp. *sitchensis* and ssp. *grayi* are rare in the Queen Charlotte Islands. The former is never subalpine as in the interior of British Columbia, but is strictly a lowland tree of open forested habitats along the shores of salt-water inlets, lakes, and rivers. In contrast, ssp. *grayi* is the subalpine phase found only at tree line near our 1957 and 1964 camp site at Takakia Lake and on north-facing, open-forested slopes at about 1,800 ft on Mosquito Mountain.

Spiraea

375. Spiraea douglasii Hook ssp. **menziesii** (Hook.) Calder & Taylor, Can. J. Bot. 43: 1395. 1965.

S. menziesii Hook., Fl. Bor.-Amer. 1: 173. 1832; *S. douglasii* var. *menziesii* (Hook.) Presl, Epim. Bot. 195. 1852.

MORESBY ISLAND: Skidegate Lake, *CST21957* (DAOM), *CST23630*, *CT36062;* Red Mud Marsh, *CST23183.*

This subspecies of *S. douglasii* differs from the more southern coastal ssp. *douglasii*, which extends from southwestern British Columbia to northwestern California, in never having conspicuous grayish-tomentose pubescence on the lower surface of the leaves. The material from the Queen Charlotte Islands is part of a population that extends from the southern part of the Alaska panhandle south along the British Columbia coast to Washington and northern Oregon and inland to Idaho.

Spiraea douglasii was only noted at the two stations cited, but it should be

present in similar habitats in the lowlands of eastern Graham Island. It is a conspicuous shrub with showy, rose-colored flowers in dense inflorescences.

Leguminosae

Shrubs; flowers solitary in leaf axils
- Leaves and branches spine-tipped..... *Ulex*
- Leaves and branches not spine-tipped..... *Cytisus*

Herbs, often somewhat woody at base; flowers racemose, capitate or spicate (sometimes solitary in leaf axils in *Vicia sativa*)
- Leaves trifoliolate
  - Flowers in narrow elongate racemes..... *Melilotus*
  - Flowers in dense heads or short spikes..... *Trifolium*
- Leaves palmate or pinnate
  - Leaves palmate..... *Lupinus*
  - Leaves pinnate
    - Plants scapose; leaves without tendrils..... *Oxytropis*
    - Plants leafy-stemmed; leaves with tendrils (except in *L. littoralis*)
      - Style flattened upwards, bearded along the upper side for a short distance below the apex.... *Lathyrus*
      - Style filiform, bearded on all sides at the apex. *Vicia*

Cytisus

376. *Cytisus scoparius (L.) Link, Enum. Hort. Berol. Alt. 2: 241. 1822.

GRAHAM ISLAND: Tlell, *CST21347A & B.*

MORESBY ISLAND: Skidegate Lake, *CT35152, CT35153.*

Cytisus scoparius was noted growing in gardens and as an occasional escape as Masset, Port Clements, and Queen Charlotte City. The only extensive colonies are at Tlell, where in 1957 it was found to be spreading aggressively along roadsides in sandy soil back from the beach dunes. In the seven years since our first survey it has become established in a few places along the road between Tlell and Port Clements. In 1964 a few other small colonies were noted at the bridge at Skidegate Lake and near Moresby Logging Camp at the head of Cumshewa Inlet. The yellow-flowered f. *scoparius* is more common on the Islands than f. *andreanus* (Puissant) Zabel, which has yellow flowers with maroon or maroon-tipped wings.

Cytisus scoparius is restricted to localized populations on the Islands. It is, however, widely introduced, well established, and spreading rapidly on southern Vancouver Island, the Gulf Islands, and the adjacent mainland. It many areas, it is a serious pest along roadsides, in abandoned clearings, and in logged-over

forests. There is a disjunct population at Kootenay Lake in the interior of the Province and there are sporadic records from Nova Scotia and Prince Edward Island.

Lathyrus

Plants densely villous; tendrils lacking	*L. littoralis*
Plants never densely villous; tendrils present	
Flowers cream-colored to ochroleucous; woodland plants	*L. ochroleucus*
Flowers light blue to purple; maritime plants	
Stems winged; largest stipules less than 0.6 cm wide, much shorter than the leaflets	*L. palustris*
Stems not winged; largest stipules more than 1 cm wide, often longer than the leaflets	*L. japonicus*

377. Lathyrus japonicus Willd., Sp. Pl. ed. 4. 3: 1092. 1803.
L. maritimus Bigel., Fl. Bost. ed. 2. 268. 1824.

GRAHAM ISLAND: mouth of Sangan River, *CST21137;* Masset Spit, *CST21247;* 2½ mi S of Tlell, *CST21343, CTS34649;* near Lawnhill, *CST21732;* Torrens Islands, *CST22448;* Jungle Beach, *CST23396* (DAOM).

MORESBY ISLAND: head of Cumshewa Inlet, *CST21967;* East Copper Island, *CST22208;* South Low Island, *CTS34853;* Woodruff Bay, *CT36982;* Sandspit, *Foster & Joslin 30* (UBC), June 1901, *Newcombe* (V); Kaisun, June 1901, *Newcombe* (V).

In a treatment of the *L. japonicus* complex Fernald (1932*a*) recognized a number of varieties as occurring in North America. Despite a recent monograph of the North American species of the genus by Hitchcock (1952) the taxonomic disposition of the varieties of *L. japonicus* is still perplexing. In both studies the keys to the varieties recognized in western North America are weak, the characters used are of little diagnostic value, and the distribution patterns of the taxa are unrealistic.

We have examined approximately 60 collections from Vancouver Island north to the Aleutian Islands and have noted that while all Vancouver Island specimens are glabrous there is an increasing frequency of pubescent plants to the north. On the Queen Charlotte Islands both glabrous and pubescent plants were noted. The presence of these two phases may indicate an area where two races overlap, a situation common to a number of the other species studied from this area. Hitchcock (*in* Hitchcock *et al.*, 1961), however, points out that the degree of pubescence may be a part of the normal variation within the species. He has used the degree of tendril forking and leaflet size to separate the northern from the southern material, but these characters are also extremely variable and are of little use in separating the two varieties he recognizes. Therefore, until a thorough morphological study is completed for all geographic areas

of this species, we are referring the collections from the Islands to *L. japonicus* in the broad sense.

This species occurs along the upper parts of sand and gravel beaches especially in the stabilized driftwood zone above high tide mark along the east coasts of Graham and Moresby islands. There are few suitable habitats for it on the west coast except in the northwestern section of Graham Island where there are extensive beaches. Unfortunately we were unable to survey this area.

378. Lathyrus littoralis (Nutt.) Endl. in Walpers, Repert. Bot. Syst. 1: 722. 1842.

GRAHAM ISLAND: Tlell, *CST23177, CTS34638, CT35432;* about 4 mi N of mouth of Oeanda River, *CT35864;* mouth of Oeanda River, *CT35880;* mouth of Kliki Creek, *CT36828.*

Lathyrus littoralis, a rare species of local occurrence in the Queen Charlotte Islands, is restricted to the relatively few extensive semistabilized sand-drift areas behind driftwood along the beaches of northeastern Graham Island. It is commonly associated with other sporadically occurring beach species such as *Abronia latifolia* Eschsch., *Carex macrocephala* Willd., and *Convolvulus soldanella* L., which have essentially the same type of distribution pattern. It is heavily browsed by deer and rarely flowers or develops mature pods.

This distinct pubescent maritime *Lathyrus* ranges from Monterey County, California, to the north coast of Graham Island. Prior to our surveys of the Charlottes the northernmost records were from Clayoquot on the west coast of Vancouver Island and from Lang Bay on the mainland opposite Texada Island.

379. Lathyrus ochroleucus Hook., Fl. Bor.-Amer. 1: 159. 1831.

GRAHAM ISLAND: Juskatla, June 1952, *Schmidt.*

Lathyrus ochroleucus is widely distributed in open woodland east of the Coast Mountains in central and southern British Columbia. We did not find this species in either 1957 or 1964, but it was collected by R. L. Schmidt (British Columbia Forest Service) in 1952 from a recently logged-over area near Juskatla. We believe this species may be introduced, but can offer no firm opinion.

380. Lathyrus palustris L., Sp. Pl. 2: 733. 1753.

GRAHAM ISLAND: Lepas Bay, *CST22598;* Yakan Pt., *CST22744, CT36816.*

Lathyrus palustris was observed at only two localities during the 1957 and 1964 surveys. Its scarcity may be related to the lack of suitable habitats available as it is usually restricted to grass-sedge meadows at the coast. It is of sporadic occurrence along the adjacent British Columbia – Alaska coast, as can be seen from the few scattered stations recorded by Hultén (1947, Map 845) and Hitchcock (1952, Map 10).

LUPINUS

Leaves gray-green, silky-pubescent, upper epidermal layer with many, white, peglike structures; keel 9–12 mm long, banner shorter than keel; stems decumbent; maritime sand beaches ..... *L. littoralis*

Leaves green, pilose, upper epidermal layer with scattered, white, peglike structures; keel 13–17 (–19) mm long, banner and keel of approximately equal length; stems upright or spreading; coastal bluffs and alpine meadows ..... *L. nootkatensis*

381. Lupinus littoralis Dougl. in Lindl., Bot. Reg. 14: *pl.* 1198. 1828.

GRAHAM ISLAND: mouth of Sangan River, *CST21148*, *CST22772*, *CT35597;* about 2½ mi S of Tlell, *CST21340;* Tlell, *CTS35075;* about 1 mi SE of Masset Spit, *CT35697;* mouth of Oeanda River, *CT35881;* about 4 mi N of mouth of Oeanda River, *CT35865*.

This species is apparently restricted to the extensive, stabilized sand beaches of northeastern Graham Island that extend from Tlell north to Rose Spit and west to Masset. It often forms extensive prostrate colonies and is one of the most striking beach species in both flower and fruit. Dr. D. B. Dunn, who identified the lupines from the Queen Charlotte Islands, has pointed out that these collections apparently represent the northernmost records for this species.

Lupinus littoralis can be readily separated from *L. nootkatensis* by the presence of its gray-green, silver-colored foliage. This coloration is not primarily a result of pubescence but is produced by a surface layer of white, peglike epidermal structures that mask out the green mesophyll layers of the leaves. In *L. nootkatensis* only a few such structures are present; thus the leaves appear a much brighter and deeper green.

382. Lupinus nootkatensis Donn ex Sims, Bot. Mag. 32: *pl.* 1311. 1810. **Figure 152.**

GRAHAM ISLAND: Tlell, *CST21382;* between Skidegate and Skidegate Village, *CST21400;* Tan Mtn., *CST21622;* between Skidegate and Queen Charlotte City, *CST23260*, *CTS34777;* Shields Bay, *CT23374;* Jalun Lake, *CT35673;* Skidegate, June 2, 1910, *Spreadborough* (CAN); Long Inlet, July 25, 1897, *Newcombe* (CAN).

MORESBY ISLAND: Sandspit, *CST21103*, *CT36040;* Newcombe Peak, *CST21995;* Takakia Lake, *CST23076*, *CT36294;* Mosquito Mtn., *CT23699;* South Low Island, *CTS34841;* Tuft Islets, *CTS34873;* Mt. Moresby, *Foster & Bigg* (UBC).

Lupinus nootkatensis is found in a wide variety of habitats from exposed beach headlands to windswept cols and alpine ridges. The variation in mode of

growth reflects the diversity of habitats. For example, tall, upright, coarse plants with large showy inflorescences are found on headlands near the coast, whereas small, depressed, shrubby forms with few-flowered inflorescences occur on alpine summits. Dunn (pers. comm.) suggests that these later depauperate plants, which in some seasons do not flower because of the severity of the climate, may represent specimens growing at the extreme range of tolerance for *L. nootkatensis*.

According to Dunn, the collections from along the lowland east coast of Graham Island and the northeastern section of Moresby Island showed introgression with *L. polyphyllus* Lindl. This possible introgression is suggested by four features: habitat, short lower lip of the calyces, very long pedicels, and the rather long racemes. Dunn states, "It is possible that some of the stature of the plant and vigor [*CST21103*, *CST21382*] as suggested by the length of the racemes of the above two [numbers] is edaphic or ecological, but it is also quite possible that the physiological range of tolerance has been extended through introgression."

We have examined a series of both *L. polyphyllus* and *L. nootkatensis* from Alaska and British Columbia. The former does not occur in the Queen Charlotte Islands and is apparently absent from the adjacent coastal mainland. This geographical separation makes us believe that the robust plants from the Islands have not arisen from introgression. We support Dunn's alternate suggestion that such plants reflect ecological conditions.

Figure 152. *Lupinus nootkatensis* Donn ex Sims on a heath meadow near Takakia Lake in the Queen Charlotte Ranges, Moresby Island. (Photograph courtesy Dr. A. Sutherland Brown.)



Melilotus

Flowers white ..... *M. alba*
Flowers yellow ..... *M. officinalis*

383. *Melilotus alba Desr. in Lam., Encycl. Méth. Bot. 4: 63. 1797.

MORESBY ISLAND: Sandspit, *CT36032.*

Melilotus alba was found near the government wharf at Sandspit growing in disturbed sandy soil along the upper part of the beach. Only a single colony was noted in association with *M. officinalis* (L.) Lam.

384. *Melilotus officinalis (L.) Lam., Fl. Fr. 2: 594. 1778.

MORESBY ISLAND: Sandspit, *CT36031.*

This species was only noted near the government wharf at Sandspit. A few small scattered colonies were found in sandy soil along the upper part of the beach.

Oxytropis

385. Oxytropis campestris (L.) DC., Astrag. 59. 1802.

MORESBY ISLAND: Mt. Moresby, *CT36411.*

This species is represented in collections from the Charlottes by a single sterile rosette of simple, pilose-pubescent leaves. It has pale glabrous or ciliate-margined stipules. Occasionally clavate processes are intermixed with the ciliae along the stipule margins. We are tentatively referring the collection to *O. campestris* var. *varians* (Rydb.) Barneby, which has these characters and is known from the northern part of the Alaska panhandle. The vegetative rosette is from a dried-up creek bed at the base of a steep, north-facing runnel on the north side of Mount Moresby.

Trifolium

Plants annual; flowers yellowish, heads less than 1 cm in diameter ..... *T. dubium*
Plants perennial; flowers red, or white to pinkish white, heads always more than 1 cm in diameter
  Plants upright with well-developed taproots; flower heads short-pedunculate, involucre absent ..... *T. pratense*
  Plants usually decumbent, creeping, often forming mats, strongly rhizomatous; flower heads long- or short-pedunculate, and prominently involucrate
  Flower heads axillary, long-pedunculate, lacking

involucral bracts; flowers white, often pinkish-tinged; fruits reflexed; leaflets usually as broad as long ..... *T. repens*

Flower heads terminal with prominent involucral bracts; flowers deep red; fruits upright; leaflets much longer than broad ..... *T. wormskjoldii*

386. *Trifolium dubium Sibth., Fl. Oxon. 231. 1794.

GRAHAM ISLAND: Masset, *CST21284;* between Skidegate and Skidegate Village, *CST21408;* near Lawnhill, *CST21733;* Queen Charlotte City, *CST22471* (DAOM), *CST23005* (DAOM), *CST23010* (DAOM), July, 1924, *Smith;* Skidegate, *CST23253* (DAOM); between Queen Charlotte City and Skidegate, *CTS34778.*

MORESBY ISLAND: between Sandspit and Cape Chroustcheff, *CST20992;* Sandspit, *CST23206, CT35345, CT35347;* Copper Bay, *Foster & Joslin 9* (UBC).

A widely introduced species along roadsides and in pastures in the settled areas of eastern Graham and northeastern Moresby islands. The inflorescences of the populations on the Islands are normally composed of 8 to 18 flowers; however, at Sandspit a few small colonies had plants with 30 to 45 flowers per head.

387. *Trifolium pratense L., Sp. Pl. 2: 768. 1753.

GRAHAM ISLAND: Masset Spit, *CST22781;* Haida Pt., *CT35942.*

MORESBY ISLAND: Alliford Bay, *CST21855;* Sandspit, *CT35346.*

A common cultivated clover used as a forage crop in British Columbia; however, a relatively rare introduction on the Queen Charlotte Islands. Its apparent scarcity is related to the lack of any extensive and continuous cultivation of agricultural land on the Islands.

388. *Trifolium repens L., Sp. Pl. 2: 767. 1753.

GRAHAM ISLAND: mouth of Sangan River, *CST21143;* Masset Spit, *CST21245;* 3 mi NW of Tlell, *CST22069;* Queen Charlotte City, *CST22463;* Image Pt., *CTS34688.*

MORESBY ISLAND: Sandspit, *CT35165;* Gray Bay, *CT35242.*

A common introduced weedy clover in and around settlements on the Queen Charlotte Islands.

389. Trifolium wormskjoldii Lehm., Ind. Sem. Hort. Hamb. 17. 1825.
T. fimbriatum Lindl., Bot. Reg. 13. *pl.* 1070. 1827.

GRAHAM ISLAND: Tlell, *CST22098;* Torrens Island, *CST22438;* Dawson Inlet, *CST22851;* Lina Island, *CST22916;* Skidegate, Aug. 1910, *Hodges*, July 19, 1910, *Spreadborough* (CAN); Tlell River, July 1914, *Green* (UBC); Honna River, July 5, 1952, *Pillsbury* (UBC).

MORESBY ISLAND: Chaatl Narrows, *CST21786;* Sandspit, *CST21842, CT35164;* Copper Bay, *CST21907;* head of Cumshewa Inlet, *CST21971;* Bag Harbour, *CST22185A;* Echo Harbour, *CST22314;* Fairfax Inlet, *CT23618;* Anna Inlet, *CTS34921;* Kootenay Inlet, *CT36199;* Rose Inlet, *CT36988*; Kaisun, July 13, 1897, *Newcombe* (CAN, ND); Little Goose Bay, Sept. 10, 1961, *Pillsbury* (UBC); Ninstints, July 3, 1903, *Newcombe* (V).

Trifolium wormskjoldii is common in the grassy zone along the upper margins of tidal beaches in protected bays and inlets along both the east and west coasts. It is often a dominant species in tidal meadows, where it forms dense mats, especially along the banks of sluggish drainage channels. It is intensively browsed by deer, which are present in large numbers on the Islands.

This species is near the northern limit of its range in the Queen Charlotte Islands. We did not observe it north of Tlell along either the east or north coasts of Graham Island. There is a single record from the southern part of the Alaska panhandle (Hultén, 1947, p. 1076). This species is strictly coastal in British Columbia, but southwards in western United States it extends inland to high elevations in the mountains. The material from British Columbia is uniform, except for the leaves, which, as in many other species of the genus, vary in size and shape.

Ulex

390. *Ulex europaeus L., Sp. Pl. 2: 741. 1753.

GRAHAM ISLAND: Lina Island, *CST22910.*

MORESBY ISLAND: Sandspit, *CST21115, CT35326.*

Ulex europaeus is apparently restricted to the settled areas around Skidegate Inlet, where it is a garden escape or roadside adventive. These are the only records of this species north of southern Vancouver Island and the adjacent Gulf Islands, where it occupies similar habitats.

Vicia

Flowers 1–2 in leaf axils, subsessile to short-pedunculate.. *V. sativa*
Flowers rarely less than 10 in long-pedunculate, axillary racemes
  Leaflets usually more than 20; mature inflorescences usually much shorter than the subtending leaves; flowers ochroleucous to reddish orange, often purplish-tinged ..... *V. gigantea*

Leaflets usually less than 20; mature inflorescences usually longer than the subtending leaves; flowers purplish ..... *V. villosa*

391. Vicia gigantea Hook., Fl. Bor.-Amer. 1: 157. 1831.

GRAHAM ISLAND: Tlell, *CST21377;* near Skidegate, *CST21401, CST21722;* Langara Island, *CST22558;* Masset Spit, *CST22791;* Lina Island, *CST22920;* Queen Charlotte City, *CST23007* (DAOM); 1½ mi S of Jungle Beach, *CST23463* (DAOM); between Skidegate and Skidegate Village, *CTS34665, CT35832;* Masset, Sept. 25, 1912, *Green* (UBC); Skidegate Inlet, July 5, 1952, *Pillsbury* (UBC); Dawson Harbour, June 24, 1897, *Newcombe* (CAN).

MORESBY ISLAND: Sandspit, *CST21092, CST21845;* head of Cumshewa Inlet, *CST21962;* South Low Island, *CTS35025;* Skedans, April 1901, *Newcombe* (V).

Vicia gigantea, a conspicuous element of the coastal flora of Pacific North America, extends northward to the Alaska panhandle. It is usually found along the upper margin of sand or shingle beaches in the driftwood zone, but also occurs on rocky headlands and in open woods in the immediate vicinity of the coast. Hultén (1947, p. 1114) has incorrectly cited an Osgood collection from the Queen Charlotte Islands as occurring in Cook Inlet, Alaska.

392. *Vicia sativa L., Sp. Pl. 2: 736. 1753.

MORESBY ISLAND: Sandspit, *CT35348.*

A well-established colony of *V. sativa* was found about a hundred feet from the government wharf at the perimeter of the airport at Sandspit. It is not surprising that so many adventives have been found here as this dock has been the town's only unloading area for cargo for many years.

393. *Vicia villosa Roth, Tent. Fl. Germ. 2: 182. 1789.

MORESBY ISLAND: Sandspit, *CT36081.*

Vicia villosa is of local occurrence in the Queen Charlotte Islands. Only two plants were noted in disturbed ground at the edge of the meadow in front of the Islander Motel at Sandspit.

Geraniaceae

Geranium

Plants perennial, 20 – 45 cm tall; petals 13 – 18 mm long, free stigmatic portion of stylar column 4.5 – 6 mm long ..... *G. richardsonii*

Plants annual or biennial, 2 – 30 cm tall; petals 3 – 7 mm long; free stigmatic portion of stylar column 0.6 – 1.5 mm long
Sepals ovate-lanceolate, aristate; leaves divided at least 5/6 ..... *G. dissectum*
Sepals broadly ovate, mucronate; leaves divided ¾ or less ..... *G. molle*

394. *Geranium dissectum L., Cent. Pl. 1: 21. 1775.

GRAHAM ISLAND: Image Pt., *CTS34684.*

MORESBY ISLAND: Sandspit, *CT35329.*

Geranium dissectum was first noted on the Queen Charlotte Islands during our 1964 survey. It grows sympatrically with *Geranium molle* L. but usually flowers and matures later and is not so aggressive. *Geranium dissectum* is restricted in its distribution to the drier habitats along the coast near the entrance to Skidegate Inlet.

395. *Geranium molle L., Sp. Pl. 2: 682. 1753.

GRAHAM ISLAND: Haida Pt., *CST20864;* Image Pt., *CTS34682.*

MORESBY ISLAND: Sandspit, *CST20995*, *CT35330*, 1961, *Foster & Bigg* (UBC); Copper Bay, *Foster & Joslin 18 & 24* (UBC).

Geranium molle on southern Vancouver Island and the adjacent mainland is a well-established annual in pastures, along roadsides and in waste places. It is locally common in the grassy swards along cliffs and on rocky exposures between Queen Charlotte City and Skidegate Village on Graham Island. At Sandspit it was noted in disturbed gravelly soils and pastures near the airport.

396. Geranium richardsonii Fisch. & Trautv., Ind. Sem. Horti Petrop. 4: 37. 1837.

GRAHAM ISLAND: Tlell, July 24, 1925, *W. A. Newcombe* (V).

MORESBY ISLAND: Limestone Island, *CST22418*, *CTS34813*, June 9, 1913, *Newcombe* (UBC, V); Sandspit, June 1901, *Newcombe* (V).

The stations from the Queen Charlotte Islands represent the only coastal records for *G. richardsonii* in British Columbia. A few scattered stations occur in the Skeena River drainage system and link the widespread central British Columbia and Rocky Mountain population with that on the Charlottes. The significance of this distribution is discussed in the Introduction.

The plants from Limestone Island were restricted to south-facing talus slopes and crevices of limestone cliffs immediately above the shoreline (*see* Figure 95). The records from the two other stations, Sandspit and Tlell, are of

doubtful validity as suitable habitats are not available there. The collections may be incorrectly labeled as to locality. Carter and Newcombe (1921, p. 55) report *G. richardsonii* from Skidegate, but there is apparently no supporting herbarium specimen. Possibly their report refers to a sight record by C. F. Newcombe. Available habitats are certainly present in the vicinity of Skidegate, but we were unable to find this species there during extensive field work in this area in 1957 and 1964.

Hultén (1947, p. 1121) indicates that the closely related northern *G. erianthum* DC. occurs in the Islands, although he cites no localities. We have been unable to locate any specimen that would substantiate this range extension.

Linaceae

Linum

397. *Linum bienne Mill., Gard. Dict. ed. 8. No. 8. 1768.
L. angustifolium Huds., Fl. Angl. ed. 2: 134. 1778.

MORESBY ISLAND: Sandspit, *CST23215.*

This is the second record of *L. bienne* for Canada and the collection represents its northern limit along the Pacific coast. The other collection from New Westminster in the southwestern part of the province had been incorrectly determined as *L. lewisii* Pursh. *Linum bienne*, along the coasts of Oregon and California, has been referred to *L. angustifolium.* In the second edition of *Flora of the British Isles* (Clapham *et al.*, 1962) this epithet is now included in the synonymy of the earlier described *L. bienne.*

The material from Sandspit was collected in August 1957 in an old pasture at the edge of a coniferous woods. Careful examination of the cultivated area around Sandspit during the 1964 survey failed to reveal its presence. The population noted in 1957 probably represents a chance introduction in cereal or forage seeds. A number of other weedy species have probably become localized in this area in a similar manner.

Callitrichaceae

Callitriche

398. Callitriche heterophylla Pursh ex Darby ssp. **bolanderi** (Hegelm.) Calder & Taylor, Can. J. Bot. 43:1395. 1965.
C. bolanderi Hegelm., Verh. Bot. Ver. Brand. 10: 116. 1869; *C. heterophylla* var. *bolanderi* (Hegelm.) Fassett, Rhodora 53: 177. 1951.

GRAHAM ISLAND: between Tow Hill and Rose Spit, *CST21230;* Blackwater Creek, *T31;* 9 mi SSE of Juskatla, *T81;* between Justakla and Port Clements, *CTS35083;* Yakoun Lake, *CT36795.*

MORESBY ISLAND: between Sandspit and Cape Chroustcheff, *CST20981;* 2½ mi SW of Sandspit, *CST21077;* 3 mi E of Skidegate Lake,

CST21920; between Gray and Sheldens Bays, *CST23442;* between Moresby and Aero logging camps, *CT35291.*

In spite of a relatively recent monograph by Fassett (1951) of the New World species of *Callitriche*, there is a wide divergence of opinion as to how some of the closely related species should be treated. A number are well defined and readily separable from other members of the genus and in this category would be included *C. hermaphroditica* L., *C. marginata* Torr., and *C. stagnalis* Scop., all of which occur in British Columbia. The first is widespread, extending north to the southern part of Yukon and Alaska, and the latter two species are of local distribution in the extreme southwestern part of the province. Fassett also recorded two other species for British Columbia, *C. heterophylla* var. *bolanderi*, which is shown in his distribution map as occurring northward along the Pacific coast to southern Vancouver Island, and *C. verna* L., which is widely distributed throughout the province, both at the coast and in the interior.

We are referring all collections from the Queen Charlotte Islands to *C. heterophylla* ssp. *bolanderi.* It has fruits essentially as broad as long (within 1.0 mm) and they range from 0.8 to 1.1 mm in both length and width. The carpels have rounded edges. This species is quite distinct from *C. verna*, which has fruits that are always noticeably longer than broad (more than 1.0 mm difference) and has carpels that are sharply keeled and scarious margined above. Its fruits range from 1.0 to 1.2 mm in length and from 0.8 to 0.9 mm in width. Fassett considered *C. heterophylla* to be comprised of two races: var. *heterophylla*, with fruit 0.6 to 1.0 mm (mostly 0.7 mm) long and distributed mainly in eastern North America; and var. *bolanderi*, with fruit 0.7 to 1.2 mm (mostly 1.0 mm) long and restricted to the Pacific coast. On this basis the collections from the Queen Charlotte Islands with fruit 0.8 to 1.1 mm long (average 1.0 mm) would have to be referred to ssp. *bolanderi.* It is, however, a weak subspecies that apparently intergrades with the typical phase to the south.

The only other species relevant to this discussion is *C. anceps*, which was described by Fernald from Gaspé County in Quebec. Fassett cited only five collections of *C. anceps* from three widely separated areas in western North America; two from Utah, one from Washington, and two from Alaska. Such a distribution pattern is certainly not realistic and we strongly suspect that he incorrectly determined these disjunct collections. Fassett (*op. cit.*, p. 190) states, "The fundamental difference between *C. heterophylla* and *C. anceps* appears to be in the shape of the fruit. In the former, the fruit is slightly narrower below the middle than above the middle while in *C. anceps* they are essentially the same width below as above the middle." If this is the only significant difference between the two species it would be impossible to assign definitively some of the collections from the Pacific coast to either species for within some populations we find the two types of fruit. We have seen the Attu Island collection that Fassett cited and although it has some characters in common with *C. anceps* we are unable to refer it to this species. Two other Alaskan collections matching the one from Attu are in the herbarium of the Plant Research Institute: Naknek, *Schofield 2677*, and Summit Lake, Kenai Peninsula, *Calder 6819.* We believe that Fassett has misconstrued Fernald's concept of *C. anceps* and that this species is restricted to

eastern North America and Greenland. It is significant that Fernald did not include western North America in the range of *C. anceps* in the eighth edition of Gray's manual. The collections from Attu Island, Naknek, and the Kenai Peninsula may represent depauperate atypical forms of *C. heterophylla* at the northern limits of its range, or they might be referred to *C. fallax* V. Petr., which occurs in Kamchatka and Japan. Unfortunately we have seen no material of *C. fallax* from eastern Asia.

Callitriche heterophylla ssp. *bolanderi* is common at the margins of muddy ponds and pools, and in quiet waters along lake shores at low elevations throughout the Queen Charlotte Islands.

Empetraceae

Empetrum

399. Empetrum nigrum L., Sp. Pl. 2: 1022. 1753.

GRAHAM ISLAND: Tow Hill, *CST21195;* 10 mi E of Masset, *CST21303;* about 1½ mi SE of Port Clements, *CST21384*, June 27, 1952, *Schmidt;* Empire Anchorage, *CS21523;* 8 mi SE of Port Clements, *CST22091* (DAOM); Langara Island, *CST22531*, May 16, 1952, *Beebe* (V); Newton Pt., *CST22951* (DAOM); Shields Bay, *CT23317*, *CT23365;* 3½ mi NW of Tlell, *CTS34611;* 7 mi N of Port Clements, *CTS34703;* Dawson Inlet, *CTS35095;* near Queen Charlotte City, May 19 and July 5, 1952, *Schmidt;* Yakoun River, June 11 and July 11, 1952, *Schmidt;* Tlell, May 27, 1951, *Cowan* (UBC); Massett, July 1901, *Newcombe* (V).

MORESBY ISLAND: Harriet Harbour, *CST22272;* Echo Harbour, *CST22361;* Takakia Lake, *CST23130* (DAOM); Anna Inlet, *CTS34971;* Upper Victoria Lake, *CT35760.*

The occurrence of *E. nigrum* in North America has been discussed recently by Löve and Löve (1959). In their summary (*op. cit.*, p.37) they reached the conclusion that all collections of the black-fruited crowberry in North America should be named *E. hermaphroditum* (Lange) Hagerup. This conclusion was based on morphological and geographical dissimilarities, and a different chromosome number from that of the European and Asian *E. nigrum*. Hitchcock (*in* Hitchcock *et al.*, 1961, p. 405) has retained the western material under the Linnaean species *E. nigrum* and has not taken up the proposed name change of Löve and Löve, and Hultén (1947, p. 1127) has discussed *E. nigrum* in Alaska particularly with respect to flower types. We have examined an extensive series of collections from western Canada and agree with Hultén's statement that coastal material tends toward dioecism while interior specimens are usually monoecious with bisexual flowers. The decision by Löve and Löve to call all North American black-fruited crowberries *E. hermaphroditum* is apparently based on their extensive cytological survey, which revealed all North American populations to be tetraploid (1959, p. 36, 37). However, this broad generalization, unfortunately, has never been documented by voucher specimens and no counts have actually been reported, so that it is difficult to draw any concrete conclusions from their summary statement

(1959, p. 37): "It is demonstrated that although the species *E. nigrum* is most frequently included in American floras, populations from this continent are tetraploid and hermaphrodite and, thus, more correctly named *E. hermaphroditum*."

It is apparently impossible to distinguish *E. hermaphroditum* from *E. nigrum* on the vegetative characters in D. Löve's key (1960, p. 290). Flower types show considerable variation; in the Queen Charlotte Islands four collections have male flowers, nine have only female flowers, and two have hermaphrodite, female and male flowers. Furthermore, Good (1927, p. 505) reports that the types of flowers produced by a plant may vary with respect to the time of year they are produced. Certainly the *E. nigrum* – *E. hermaphroditum* relationship is not well understood in North America, and for this reason we are following Hultén and Hitchcock in retaining the entity from the Islands under the older epithet, *E. nigrum*. Perhaps fully documented cytological and morphological studies using mass collecting methods may give us a better understanding of this perplexing complex.

Empertrum nigrum is a widely distributed species on the Islands, extending from lowland sphagnum bogs to subalpine regions. Most populations showed good fruit set, which indicated that female or hermaphrodite flowers were present.

Violaceae

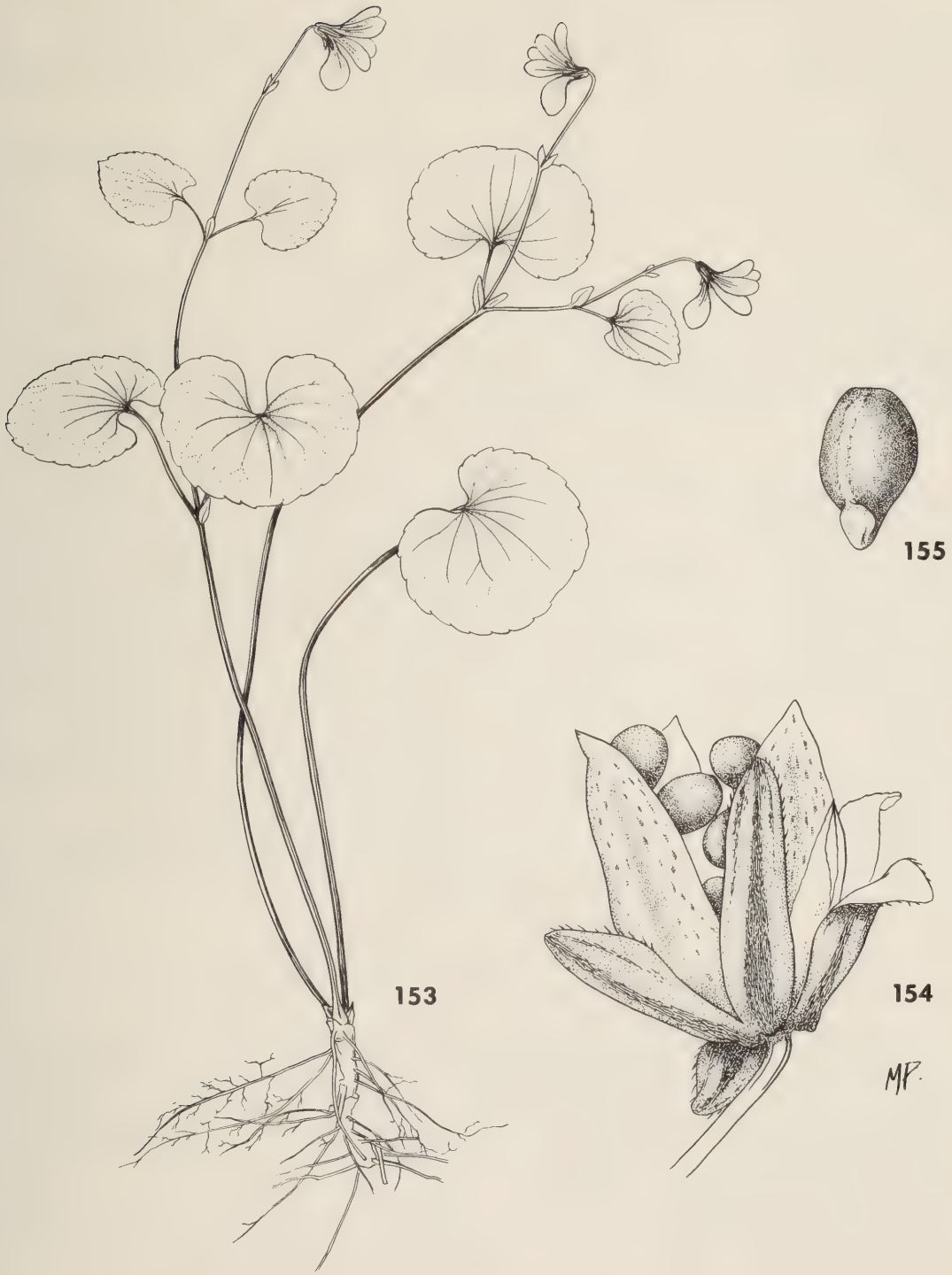
Viola

Flowers pale lilac, mauve, or purple	
Slender, elongate stolons present; flowers pale lilac or mauve	*V. palustris*
Stolons absent; flowers deep purple	
Plants arising from well-developed taproots; peduncles pubescent; low compact lowland perennials	*V. adunca*
Plants arising from well-developed creeping rhizomes; peduncle glabrous; upright montane perennials	*V. langsdorffli*
Flowers yellow	
Leaves reniform; sepals green with a conspicuous purple–black midstripe, blunt tipped, margin usually ciliate in upper half; subalpine or alpine	*V. biflora*
Leaves cordate; sepals green, lacking a midstripe, acute tipped, margin not ciliate; alpine and lowland	*V. glabella*

400. Viola adunca Smith in Rees, Cycl. 37. No. 63. 1817.

GRAHAM ISLAND: Masset, *CST20847*, June 2, 1913, *Newcombe* (UBC, V); Haida Pt., *CST20861;* Tlell, *CST20890*, *CST23181*, *CTS34642*, *CT35933;* 4½ mi E of Tow Hill, *CST21301;* 1½ mi S of Jungle Beach, *CTS23460;* Skidegate, May 25, 1901, *Newcombe* (V).

MORESBY ISLAND: between Sandspit and Cape Chroustcheff, CST20996; Sandspit, May 22, 1923, *Newcombe* (V).



Figures 153–155. *Viola biflora* L. ssp. *carlottae* Calder & Taylor. 153. Habit (× ½). 154. Ripe capsule (× 5). 155. Mature seed (× 10).

Viola adunca was in full flower when we first arrived on the Islands on May 23 for the 1957 survey. It formed very showy patches of purple in grassy swards and along the gravel edges of beaches and roadsides in the northeast lowland sections of the Islands. Some colonies possessed flowers up to 2.5 cm long. Although a number of varieties and color forms have been described, *V. adunca* is a fairly uniform species throughout British Columbia.

401. Viola biflora L., ssp. **carlottae** Calder & Taylor, Can. J. Bot. 43: 1395. 1965. **Figures 153-155.**

GRAHAM ISLAND: Tan Mtn., *CST21575;* between Ells and Mercer pts., *CST22924;* Shields Bay, *CT23293;* 3 mi SW of Jalun Lake, *CT35645;* Long Inlet, *CT35977.*

MORESBY ISLAND: Newcombe Peak, *CST22005;* Echo Harbour, *CST22379;* Takakia Lake, *CST23060A*, *CST23121*, *CT36306;* Mosquito Lake, *CT23761;* Bigsby Inlet, *CTS34893;* Anna Inlet, *CTS34924;* Mt. Moresby, *CT35320*, *CT36402;* Yatza Mtn., *CT35711;* Mt. Russ, *CT36165;* Mosquito Mtn., *CT36449;* Sunday Inlet, *CT36608.*

Viola biflora L. is essentially a circumpolar species, which in North America extends from the base of the Aleutian Islands north to Nome and eastward to the unglaciated mountains of central Yukon. Disjunct populations occur in Colorado, in the southeastern portion of the Alaskan panhandle, and in the Queen Charlotte Islands of British Columbia. The population from the Charlottes represents a distinct race, ssp. *carlottae*, which can readily be distinguished from the typical phase by the following characters: sepals blunt tipped, ciliate only in the upper half, prominently marked with a wide purple midstripe, and generally longer than in the typical phase; large flowers; and large seeds about 2.5 mm long with well-developed strophioles. This subspecies is generally more robust and larger in all its parts than ssp. *biflora.*

Viola biflora is the most common violet in the subalpine and alpine zones of the Queen Charlotte Ranges. Occasionally it extends down almost to sea level in exposed rocky habitats on the west coast.

402. Viola glabella Nutt. in T. & G., Fl. N. Amer. 1: 142. 1838.

GRAHAM ISLAND: Queen Charlotte City, *CST20904*, *CST23021;* Jungle Beach, *CST20935;* Empire Anchorage, *CS21485;* Tan Mtn., *CST21601;* Dawson Inlet, *CTS35109;* 6 mi S of Juskatla, *CT35503;* Jalun Lake, *CT35679;* Juskatla, June 15, 1952, *Schmidt;* Masset, June 2, 1913, *Newcombe* (UBC); Honna Trail, *Pillsbury 373* (UBC).

MORESBY ISLAND: 1 mi E of Skidegate Lake, *CST21002;* Mosquito Lake, *CST21023;* 1 mi S of Copper Bay, *CST21923;* Newcombe Peak, *CST22006;* Echo Harbour, *CST22378;* Takakia Lake, *CST23060*, *CT36298;* Mt. de la Touche, *CT23556;* Tasu Sound, June 26, 1961, *Foster & Bigg* (UBC);

Cumshewa, May 1901, *Newcombe* (V); Gowgaia Bay, May 30, 1901, *Newcombe* (V); Ikeda, June 10, 1913, *Newcombe* (V).

Viola glabella is a wide-ranging Cordilleran species that grows at both low and high elevations. On the Queen Charlotte Islands it is a common woodland species along creeks and rivers, but it also occurs as scattered populations in the subalpine and alpine regions of the interior mountain ranges. It is at these latter sites that hybrids between *V. glabella* and *V. biflora* ssp. *carlottae* Calder & Taylor were noted. They possess intermediate characters between the putative parents.

Viola glabella flowers throughout the months of May and June and most populations set abundant seed.

403. Viola langsdorffii (Regel) Fisch. in DC., Prodr. 1: 296. 1824.

GRAHAM ISLAND: Tan Mtn., *CST21585;* Jalun Lake, *CT35677.*

MORESBY ISLAND: Echo Harbour, *CST22378A;* Takakia Lake, *CST23109, CT36264, Foster & Joslin 65A* (UBC); Bigsby Islet, *CTS34890;* Anna Inlet, *CTS34963;* Mt. Moresby, *CT36425.*

Viola langsdorffii is a conspicuously large-flowered subalpine–alpine species that has its southern limits along the Pacific coast on the Queen Charlotte Islands and in the adjacent Skeena River drainage system of mainland northwestern British Columbia. As Baird (1942, p. 176) has pointed out, reports by American authors of the occurrence of this *Viola* in western coastal states are probably incorrect. *Viola langsdorffii* is readily distinguished from *V. palustris* L. by its robust ascending rhizomes or rootstocks, the large deep-violet petals, the ovate-lanceolate sepals, and the absence of stolons.

This species was often collected in runnels and on slopes above 1,000 ft in the Queen Charlotte Ranges, but it also occurs at lower elevation in meadows and on open, grassy rock outcrops along the base of mountains. It was particularly abundant on open grassy stabilized talus slopes between 2,300 and 2,800 ft at Takakia Lake.

404. Viola palustris L., Sp. Pl. 2: 934. 1753.

GRAHAM ISLAND: 10½ mi S of Tlell, *CST20883;* near mouth of Sangan River, *CST21139;* Yakan Pt., *CST21312;* Empire Anchorage, *CS21503;* McClinton Bay, *CST21582;* about 3 mi E of Masset, *CST22761* (DAOM); 2½ mi S of Tlell, *CST23409, CTS34661;* Blackwater Creek, *CTS35070, T46, S3542* (DAOM); 2 mi NW of Tlell, *CT35687;* Marie Lake, June 10, 1952, *Schmidt;* Langara Island, May 21, 1952, *Beebe* (V); Masset, July 1914, *Green* (UBC), May 28, 1951, *Cowan* (UBC).

MORESBY ISLAND: 1 mi E of Skidegate Lake, *CST21003;* Skidegate Lake Bridge, *CST21008, CT23633;* Sandspit, *CST21086;* Red Mud Marsh,

CST22066 (DAOM), *CST23190* (DAOM); east end of Skidegate Lake, *CST23416* (DAOM); Bigsby Inlet, *CTS34889;* Upper Victoria Lake, *CT35972.*

Viola palustris on the Queen Charlottes is near the northern limit for this species along the northwest Pacific coast. Although it is not reported by Hultén in his *Flora of Alaska and Yukon*, examination of our herbarium material from Alaska reveals a collection from Juneau (*Anderson 6313*). The distinction between *V. palustris* and the closely related *V. epipsila* ssp. *repens* (Turcz.) Becker is discussed by Baird (1942, p. 172) and she indicated that the latter replaces *V. palustris* as the coastal entity from southeast Alaska westward to the outer Aleutian Islands.

Viola palustris on the Queen Charlotte Islands is essentially a lowland, moist meadow or sedge swale species. It also occurs in shaded thickets along creeks and on rocky beaches of lakes.

Onagraceae

Perianth parts in twos; fruit indehiscent with hooked bristles, 1- or 2-seeded ..... *Circaea*

Perianth parts in fours; fruit dehiscent, glabrous, or pubescent, never with hooked bristles; many-seeded, seeds with a tuft of hairs at one end..... *Epilobium*

Circaea

405. Circaea alpina L., Sp. Pl. 1: 9. 1753.

Leaves strongly toothed, cordate; stems lacking strigose pubescence on upper portion of internodes; flowers conspicuously red in bud; most plants flowering in August or September ..... ssp. *alpina*

Leaves not conspicuously toothed or cordate, usually rounded at base; stems strigose-pubescent on upper portion of internodes; flowers green or cream-colored in bud; most plants flowering in June ..... ssp. *pacifica*

405a. Circaea alpina L. ssp. **alpina**

GRAHAM ISLAND: Blackwater Creek, *S3527;* Tarundl Creek, *CT36978.*

MORESBY ISLAND: Mosquito Lake, *CT36710.*

405b. Circaea alpina L., ssp. **pacifica** (Asch. & Magnus) Raven in Calder & Taylor, Can. J. Bot. 43: 1396. 1965.

C. pacifica Asch. & Magnus, Bot. Zeit. 29: 392. 1871; *C. alpina* var. *pacifica* M. E. Jones, Bull. Univ. Mont. Biol. 15: 39. 1910.

GRAHAM ISLAND: Honna River, *CTS34802, CT36934;* 4½ mi S of Port Clements, *CTS35038, CT35560;* 8 mi SSW of Juskatla, *CT35476;* Yakoun River 16 mi S of Juskatla, *CT35496;* Long Inlet, *CT35968;* Mamin River Delta, *T133;* Mamin River, June 4, 1952, *Schmidt.*

MORESBY ISLAND: 3 mi S of Copper Bay, *CST21885.*

The taxonomic relationship of *C. alpina* to *C. pacifica* in the Pacific Northwest has recently been reviewed by Raven (pers. comm.) and he recognizes a single species with two subspecies. *Circaea alpina* ssp. *pacifica* is restricted to the Cordilleran region and is characterized by shallowly toothed and weakly cordate leaves, the presence of short strigose pubescence at the nodes, and robust stature. In contrast, ssp. *alpina* has a circumpolar distribution and extends in North America from the Atlantic to the Pacific coast in the north temperate zone. This phase is characterized by its prominently toothed cordate leaves, absence of pubescence at the nodes, the usually reddish-colored flowers in bud, and smaller stature. A further distinction between the two subspecies in British Columbia is evident if flowering times are plotted. The typical subspecies usually flowers in August or early September, whereas ssp. *pacifica* commonly flowers in June or early July. Some overlapping of flowering occurs, particularly where the two populations grow sympatrically. In these zones of overlap intermediates may occur between the two subspecies.

On the Queen Charlotte Islands ssp. *pacifica* is more widespread in its distribution than the typical phase. Both subspecies frequent a number of lowland mature coniferous forest habitats on the east flanks of the Queen Charlotte Ranges and have their best development on semiopen grass benches along water courses.

Epilobium

Petals entire, spreading; corolla large and showy
- Leaves green to reddish green, usually 10–20 cm long, membranaceous, prominently reticulately veined beneath; styles pubescent at base ..... *E. angustifolium*
- Leaves green to bluish green, glaucous, usually 2.5–7 cm long, fleshy, not prominently veined beneath; styles glabrous ..... *E. latifolium*

Petals notched, ascending; corolla small and often inconspicuous
- Plants annual; conspicuous fascicles of leaves in leaf axils ..... *E. minutum*
- Plants perennial; fascicles of leaves in leaf axils absent
  - Stems simple; leaves narrowly ovate, margin occasionally revolute; ovary densely canescent ..... *E. palustre*
  - Stems simple or branched above; leaves lanceolate, ovate, or elliptic, margin never revolute; ovary never densely canescent

Plants caespitose; leaves weakly or irregularly serrulate, ovate to elliptic, 0.5–1.3(–2) cm long; inflorescence strongly nodding in bud... *E. anagallidifolium*

Plants not caespitose; leaves distinctly serrulate, lanceolate, usually more than 3 cm long (except in *E. brevistylum* where they may be 1–6 cm long); inflorescence upright or weakly nodding in bud

Leaves narrowly cuneate at base, distinctly short-petioled; plants 1–2 dm tall, stems never virgately branched above..... *E. delicatum*

Leaves truncate at base, sessile or subsessile; plants usually more than 2 dm tall; stems often virgately branched above

Petals 3–5 mm long, rose-purple; stems often virgately branched above; ovary pilose, never glandular-pubescent..... *E. glandulosum*

Petals about 2.5 mm long, white; stems never virgately branched above; ovary sparingly glandular-pubescent, never pilose..... *E. brevistylum*

406. Epilobium anagallidifolium Lam., Encycl. Méth. Bot. 2: 376. 1786. **Figure 160.**

MORESBY ISLAND: 3 mi E of Skidegate Lake, *CST21919;* Takakia Lake, *CST23051;* Mt. Moresby, *CT23746*, July 1961, *Foster & Bigg* (UBC); between Cumshewa and Peel inlets, *CT35170;* Skidegate Lake, *CT35282*, *Joslin 10* (UBC); between Moresby and Aero logging camps, *CT35290.*

This circumpolar species has often been designated as *E. alpinum* L., but as Raven (pers. comm.) points out, this Linnaean epithet has been abandoned as it is a *nomen confusum* based on a mixture of *E. lactiflorum* Hausskn. and *E. anagallidifolium.* Recently Hitchcock (*in* Hitchcock *et al.*, 1961, p. 474–475) has taken up the name *E. alpinum* for a large number of closely related species, *E. lactiflorum*, *E. oregonense* Hausskn., *E. hornemannii* Reichb., *E. clavatum* Trel., and others; however, this extreme lumping has contributed little toward the clarification of the problem and, in fact, has added more nomenclatural problems to a group already beset with confusion. We concur with Raven in recognizing a number of these taxa at specific rank and believe that further segregation or lumping must await a detailed study of the small-flowered complex.

Epilobium anagallidifolium is both a lowland and alpine species on the Queen Charlotte Islands. It is always associated with very moist habitats and commonly occurs along the gravel and loose shale banks of alpine rivulets. Its distribution is restricted to the main mountain mass immediately south of Skidegate Channel.

407. Epilobium angustifolium L., Sp. Pl. 1: 347. 1753.

GRAHAM ISLAND: Masset, *CST22758;* between Skidegate and Queen Charlotte City, *CST23263;* between Millar Creek and Skidegate Village, *CT36691.*

MORESBY ISLAND: Skedans, *CST22427;* islet off Alliford Bay, *CST23231;* Tuft Islets, *CTS34865;* Sandspit, *CT36072;* Horn Rock, *CT36517*, Aug. 10, 1957, *Mills;* Kaisun, July 15, 1897, *Newcombe* (CAN, V).

Epilobium angustifolium occurs sporadically throughout the Islands and is usually found on open rocky bluffs or shingle beaches at the coast. The populations near Queen Charlotte City and Skidegate Village indicate the possibility of invasion of an indigenous species into and around disturbed areas at the townsites.

This species never forms the large showy stands that are so common in the interior parts of British Columbia. The localized populations on the Queen Charlotte Islands are typical of its distribution on Vancouver Island and the adjacent mainland.

408. Epilobium brevistylum Barbey in Brewer & Wats., Bot. Calif. 1: 220. 1876. **Figure 159.**

GRAHAM ISLAND: near mouth of Oeanda River, *CT35904.*

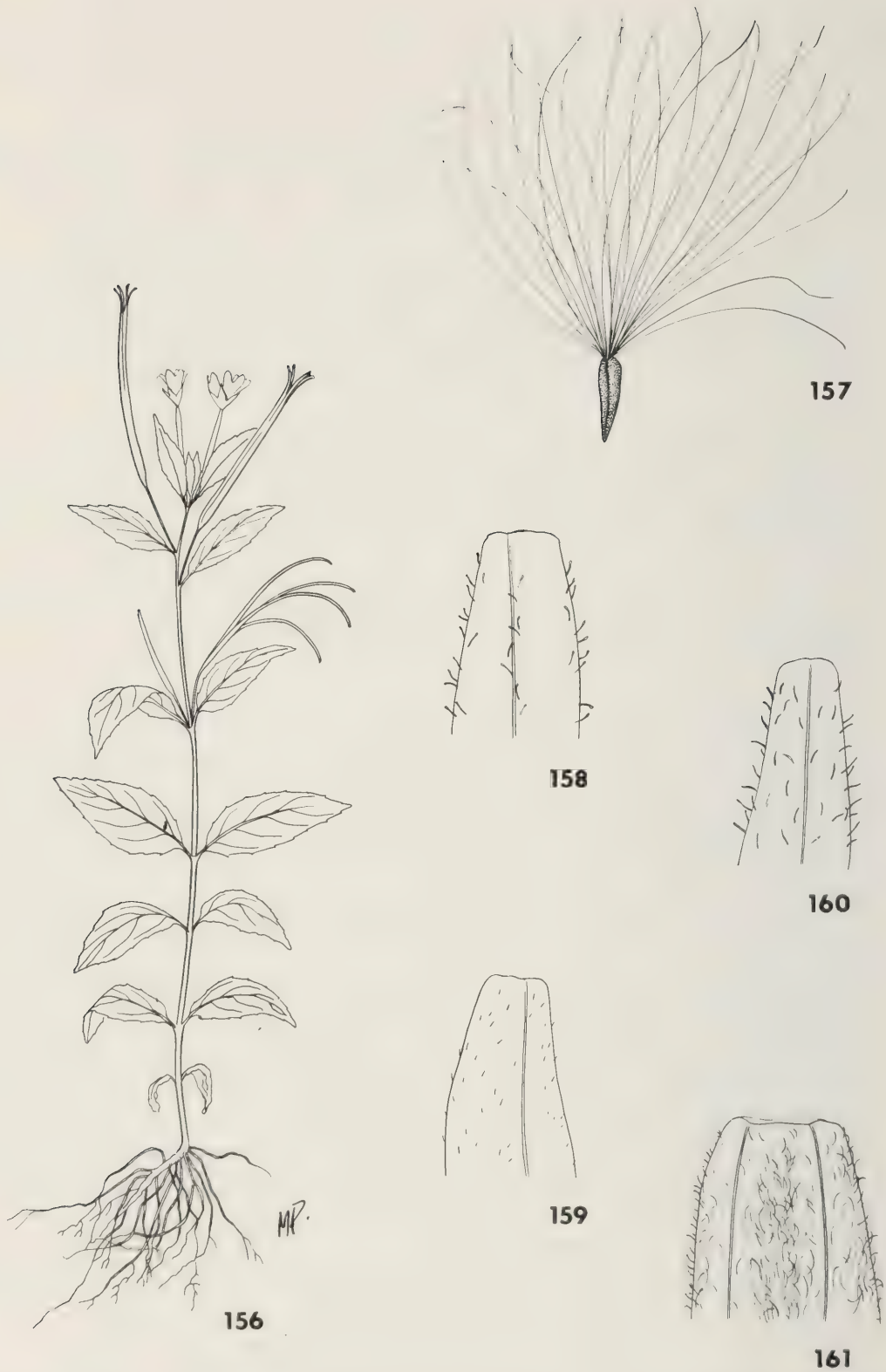
MORESBY ISLAND: near Copper Bay, *CST21926*, *Joslin 42* (UBC); between Cumshewa and Peel Inlets, *CT35107A*, *CT35185B;* Skidegate Lake, *CT35280;* between Moresby and Aero Logging Camps, *CT35284;* near Alliford Bay, *CT35358B;* Mt. Moresby, *CT36390.*

Epilobium brevistylum has been included recently in the synonymy of *E. glandulosum* var. *tenue* (Trel.) C. L. Hitchc. by Hitchcock (*in* Hitchcock *et al.*, 1961, p. 477). However, most American authors recognize this entity as a distinct species that can be distinguished from *E. glandulosum* by short white petals (occasional pink-petaled flowers are seen in large populations), simple unbranched habit, and sparsely glandular-pubescent ovaries.

This species occurs only in lowland habitats and was particularly common in the extensive Skidegate Lake burn. The station near the mouth of the Oeanda River on the east coast of Graham Island represents the northernmost record for *E. brevistylum* along the Pacific coast of North America.

409. Epilobium delicatum Trel., Rep. Missouri Bot. Gard. 2: 98. 1891. **Figures 156-158.**

GRAHAM ISLAND: Tow Hill, *CST21192*, *CST22667;* McClinton Bay, *CST21661;* between Ells and Mercer pts., *CST22906;* Shields Bay, *CT23343;* Blackwater Creek, *CTS35054*, *T55*, *S3540;* Honna River, *CT35412;* Jalun Lake, *CT35637*, *CT35638.*



Figures 156–161. 156. *Epilobium delicatum* Trel., habit (× ½). 157. *E. delicatum*, seed with coma (× 10). 158. *E. delicatum*, pubescence on capsule (× 12). 159. *E. brevistylum* Barby in Brewer & Wats. pubescence on capsule (× 12). 160. *E. anagallidifolium* Lam., pubescence on capsule (× 12). 161. *E. glandulosum* Lehm., pubescence on capsule (× 12).

MORESBY ISLAND: Skidegate Lake Bridge, *CST21013;* 3 mi S of Copper Bay, *CST21898;* below Newcombe Peak, *CST22049, CST22049A;* Echo Harbour, *CST22333;* Takakia Lake, *CST23051A;* Mt. de la Touche, *CT23594;* between Cumshewa and Peel inlets, *CT35185A;* Kaisun, *CT36560;* Sunday Inlet, *CT36631.*

Epilobium delicatum is closely allied to *E. glandulosum*, but may be distinguished from it by distinctly petiolate leaves and smaller stature. The flowers are usually purplish but a few pale-petaled specimens were observed. The species is widely distributed throughout the Islands in both lowland and alpine habitats. It is often a conspicuous element of rocky runnels and wet mountain slopes in alpine situations. The taxonomic relationships of this entity to the other closely allied small-flowered species of western North America need clarification.

410. Epilobium glandulosum Lehm., Stirp. Pug. 2: 14. 1830. **Figure 161.**

GRAHAM ISLAND: 2 mi N of Skidegate Village, *CST22094;* Queen Charlotte City, *CST22430, CT36970, CT36972;* Lepas Bay, *CST22600;* Tow Hill, *CST22667A;* Masset Spit, *CST22790;* Jungle Beach, *CST23393;* about 2½ mi S of Tlell, *CST23410;* between Skidegate and Skidegate Village, *CT35837;* MacIntosh Meadows, Aug. 23, 1961, *Foster & Bigg* (UBC); Canoe Channel, June 23, 1897, *Newcombe* (CAN).

MORESBY ISLAND: Sandspit, *CST21812;* East Copper Island, *CST22260;* between Sandspit and Copper Bay, *CST23192;* Skidegate Lake, *CT23639;* between Cumshewa and Peel inlets, *CT35179;* near Alliford Bay, *CT35358A;* Copper Bay, *Foster & Joslin 39* (DAO, UBC); islet off Bolkus Islands, *Foster & Joslin 81* (UBC).

Epilobium glandulosum is a polymorphic species widely distributed throughout the Pacific Northwest. Many segregates have been described. This species is an essentially lowland entity that is particularly abundant along the coastal strand of eastern Moresby and Graham islands. It is usually a branched, robust plant, up to 4 dm high, with large sessile leaves. Smaller plants were noted on grassy headlands at the coast.

411. Epilobium latifolium L., Sp. Pl. 1: 347. 1753.

MORESBY ISLAND: Takakia Lake, *CST23054, CT36364;* Mt. Moresby, *CT36373.*

Epilobium latifolium is rare on the Queen Charlotte Islands. It was noted at only two localities during our two summer surveys. The Takakia Lake population consisted of a small number of plants growing on an alluvial gravel fan at the margin of the lake. It was composed of sterile plants both in 1957 and 1964 and we can only surmise that some of them might flower during exceptionally warm summers. In 1964 we located a second colony in a runnel on the

north face of Mount Moresby. Plants in this population were in early bud and would have undoubtedly flowered before the summer season was over. The small number of plants in the populations coupled with the abnormally depauperate vegetative development of the individuals indicates that *E. latifolium*, like *Leptarrhena pyrolifolia* (D. Don) R. Br., may eventually be eliminated from the flora unless there is a general change in the climate, and conditions so produced are more favorable for sexual reproduction.

412. Epilobium minutum Lindl. ex Hook., Fl. Bor.-Amer. 1: 207. 1832.

GRAHAM ISLAND: between Skidegate and Skidegate Village, *CST21399 CST21725, CT35383;* Skidegate, May 30–31, 1923, *Newcombe* (V).

MORESBY ISLAND: Hotspring Island, *CST22302;* Limestone Island, *CST22414;* South Low Island, *CTS34849;* Low Island, *CTS35008.*

Epilobium minutum is a common annual of open, rocky, and grassy bluffs in the relatively dry eastern section of Vancouver Island. It occurs on the Gulf Islands, along the adjoining mainland coast and is found sporadically in the interior of the province at least as far east as Kootenay Lake. This species is at its northern limit on the Queen Charlotte Islands, where it is found along the east coast on bluffs bordering Skidegate Inlet, on rocky exposures along the south shore of Limestone and adjacent islands and on open rock bluffs below the springs on Hotspring Island. At all these localities it is either rare or widely scattered. We have not seen any collections from along the coast between the Charlottes and Vancouver Island.

Many of the short-statured plants from the mainland, Vancouver Island, and all plants from the Queen Charlotte Islands have conspicuous fascicles of smaller leaves in many of the leaf axils. This character is often used to separate *E. paniculatum* Nutt. from *E. minutum*, but its diagnostic value is questionable. Torrey and Gray (1840) based *E. minutum* var. *foliosum* partly on the presence of such fascicles of leaves, but there appears to be little phytogeographical evidence for maintenance of this variety. The presence of fascicled leaves should be included in the description of *E. minutum* and its use discontinued as a key character for distinguishing *E. paniculatum* from *E. minutum.*

413. Epilobium palustre L., Sp. Pl. 1: 348. 1753.

GRAHAM ISLAND: about 3 mi E of Tow Hill, *CST22748;* Yakan Pt., *CT36807.*

This wide-ranging marsh or bog species is rare on the Islands, in spite of the abundance of suitable habitats. A single plant was collected in an inundated sedge meadow between old stabilized beach ridges well back from the point of Rose Spit at the northeastern tip of Graham Island. A second collection was made in 1964 in a similar habitat at Yakan Point.

Haloragidaceae

Myriophyllum

414. Myriophyllum spicatum L., Sp. Pl. 2: 992. 1753.

GRAHAM ISLAND: near mouth of Honna River, *CT36945.*

MORESBY ISLAND: Mosquito Lake, *CT23657.*

A single small submerged plant of *Myriophyllum* was collected on August 21, 1957, during a survey of the aquatic vegetation of Mosquito Lake. In 1964, a large population was found in an isolated backwater in the forested flood plain near the mouth of the Honna River. These are the only known stations for this species on the Islands, although many suitable habitats were observed during the two summer surveys. No fruiting material was found. The two collections are tentatively referred to *M. spicatum.*

Hippuridaceae

Hippuris

Plants less than 1 dm tall with delicate rhizomes less than 1 mm in diameter; mature aerial leaves less than 1 cm long with a single main vein; flowers imperfect; subalpine plants above 1,500 ft..... *H. montana*

Plants robust, usually more than 1.5 dm tall with rhizomes always more than 1 mm in diameter; mature aerial leaves more than 1 cm long with the major venation pinnate; flowers perfect; lowland plants..... *H. vulgaris*

415. Hippuris montana Ledeb. in Reichenb., Ic. Bot. 1: 71. 1823.

GRAHAM ISLAND: Shields Bay, *CT23350.*

MORESBY ISLAND: Mosquito Mtn., *CT23750;* Takakia Lake, *CT36315.*

Dale and McCully (1961) suggest that *H. montana* is an environmental phenotype of *H. vulgaris.* We disagree with their viewpoint on the grounds that the habitat and morphology of the two species are distinct, and that they are isolated altitudinally. *Hippuris montana* is a terrestrial species restricted to subalpine mountainous regions above 1,500 ft, whereas *H. vulgaris* is a lowland plant of aquatic habitats. The two species may be readily separated on flower type and the organization of the inflorescence. *Hippuris montana* has imperfect flowers, the pistillate occurring in the upper leaf axils of the upright branches and the staminate below. Frequently the inflorescence appears to be entirely pistillate. All inflorescences examined in *H. vulgaris* have perfect flowers.

Hippuris montana is a characteristic element of wet grassy slopes and rocky runnels in subalpine regions of the Queen Charlotte Ranges. Although of common and widespread occurrence, it is not often collected because of its diminutive size and insignificant appearance.

416. Hippuris vulgaris L., Sp. Pl. 1: 4. 1753.

GRAHAM ISLAND: Yakan Pt., *CST21317;* about 4 mi E of Masset, *CST22764*, *CT35603;* about 2½ mi S of Tlell, *CST23402*, *CST34663;* about 4 mi N of mouth of Oeanda River, *CT35853;* Tlell, July 25, 1925, *Newcombe* (V).

Hippuris vulgaris was found in shallow, muddy pools or in inundated sedge meadows behind beaches only along the lowland coast of northeastern Graham Island. Suitable habitats for this species were seen in the northeast section of Moresby Island, but no plants were observed. Few flowering and fruiting specimens were found in the populations sampled.

Araliaceae

Oplopanax

417. Oplopanax horridus (Sm.) Miq., Ann. Mus. Bot. Lugd.-Bat. 1: 16. 1863.
Fatsia horrida (Sm.) Benth. & Hook., Gen. Pl. 1: 939. 1867.

GRAHAM ISLAND: Empire Anchorage, *CS21491;* McClinton Bay, *CST21657;* Blackwater Creek, *T54;* Honna River, *CTS34801;* Jalun Lake, *CT35613;* Langara Island, June 1, 1952, *Guiget* (V); Skidegate, April 1901, *Newcombe* (V).

MORESBY ISLAND: 2-3 mi E of Skidegate Lake, *CST21916;* Echo Harbour, *CST22329;* Fairfax Inlet, *CT23569;* between Copper Bay and Skidegate Lake, *CT23670;* Bigsby Inlet, *CTS34902;* Sunday Inlet, *CT36624;* about 2 mi W of Skidegate Lake, *CT36701.*

Oplopanax horridus is widely distributed throughout the Queen Charlottes except in the drier sections of eastern Graham and Moresby islands. It rarely forms large colonies but is a conspicuous element of the lowland coniferous forests on alluvial flats bordering the Queen Charlotte Ranges. Occasionally it extends to about 1,000 ft on wooded mountain slopes. In open forest where there is little competition it may reach a height of 5 m. Its interesting disjunct distribution has been discussed and illustrated by Fernald (1925*b*). At a later date Raup (1934) extended its western range to include the upper Peace River, and a still more recent collection (Maloney's Cabin, Ft. Nelson River, 59°14′N 123° 15′W, July 9, 1944. *Nowosad 35*) extends its range to extreme northeastern British Columbia.

Umbelliferae

Plants rhizomatous or stoloniferous, rooting at the nodes
- Leaves reduced to narrow, entire, elongate, septate phyllodes; inflorescence a few-flowered simple umbel ..... *Lilaeopsis*
- Leaves pinnately compound; inflorescence a many-flowered compound umbel ..... *Oenanthe*

Plants not rhizomatous or stoloniferous
- Fruiting inflorescence open, wide-spreading; fruits narrow, much longer than wide; involucre usually absent ..... *Osmorhiza*
- Fruiting inflorescence tightly compact; fruits broad, not much longer than wide; involucre conspicuous
  - Basal leaves palmately or pinnipalmately 3- to 5-lobed or -cleft; fruits covered with uncinate prickles ..... *Sanicula*
  - Basal leaves pinnately or ternately compound; fruits glabrous
    - Basal leaves bi- to tri-pinnate, finely dissected; leaflets small, delicate
      - Root crowns distinctly coarse fibrous ..... *Ligusticum*
      - Root crowns not coarse fibrous ..... *Conioselinum*
    - Basal leaves pinnate, occasionally bipinnate; leaflets large and coarse
      - Plants prostrate; basal leaves conspicuously tomentose beneath; a sand beach species. . *Glehnia*
      - Plants upright; basal leaves never conspicuously tomentose beneath; not a sand beach species
        - Upper nodes conspicuously tomentose or woolly-villous; leaflets large, up to 4 dm long ..... *Heracleum*
        - Upper nodes glabrous; leaflets less than 1 dm long
          - Leaves biternate, occasionally ternate; fruit not broadly ribbed ..... *Ligusticum*
          - Leaves usually pinnate-ternate, rarely biternate; fruit with some broadly flattened ribs ..... *Angelica*

Angelica

418. Angelica lucida L., Sp. Pl. 1: 251. 1753.
Coelopleurum gmelini Ledeb., Fl. Ross. 2: 361. 1844.
C. longipes Coult. & Rose, Contr. U.S. Nat. Herb. 7: 142. 1900.

GRAHAM ISLAND: Tow Hill, *CST22654*, *CTS34759;* Jungle Beach, *CST23387;* about 4 mi N of mouth of Oeanda River, *CT35878;* Skidegate, May 1901, *Newcombe* (V).

MORESBY ISLAND: Newcombe Peak, *CST21998;* islet off Bolkus Islands, *CST22225;* Skedans Islands, *CST22394;* Mt. de la Touche, *CT23545;* South Low Island, *CTS34990;* Low Island, *CTS35001;* Takakia Lake, *CT36336;* Gowdas Islands, *CT36572;* Sunday Inlet, *CT36601;* Cumshewa, May 1901, *Newcombe* (V).

Angelica lucida is a common and conspicuous element of rocky exposures and the stabilized driftwood zone along the upper limits of many of the beaches that we surveyed. It also occurs on cliffs and in rocky runnels on mountain slopes and was collected near or above tree line on Newcombe Peak, Mount de la Touche, and the mountains around Takakia Lake. In North America *A. lucida* is strictly a coastal species in the southern part of its range, but at about 54°N it extends inland through the Skeena River drainage to the east flank of the Rocky Mountains (Fairy Lake, 57°20′N 123°51′W, *Calder & Kukkonen 27345*). It has also been reported by Hultén (1947, p. 1179) from central Alaska.

Conioselinum

419. Conioselinum pacificum (S. Wats.) Coult. & Rose, Contr. U.S. Nat. Herb. 7: 152. 1900.

Selinum hookeri S. Wats. ex Coult. & Rose, Rev. N. Amer. Umbell. 45. 1888.

C. gmelini (Cham. & Schlecht.) Coult. & Rose, Contr. U.S. Nat. Herb. 7: 150. 1900, *non* (Bray) Steud.

C. benthami (S. Wats.) Fernald, Rhodora 28: 221. 1926.

GRAHAM ISLAND: Tow Hill, *CST21185* (DAOM), *CST22655;* McClinton Bay, *CST21635* (DAOM); Torrens Island, *CST22447* (DAOM), *CT35829;* Lepas Bay, *CST22592;* Masset Spit, *CST22782;* Dawson Inlet, *CST22853;* between Ells and Mercer pts., *CST22907A;* 1½ and 2½ mi S of Jungle Beach, *CST23462*, *CT36696;* Naden Harbour, *CT36839;* Langara Island, June 1, 1952, *Guiget* (V); Dakwa, July 1902, *Newcombe* (V).

MORESBY ISLAND: between Sandspit and Cape Chroustcheff, *CST20983* (DAOM); Chaatl Narrows, *CST21801* (DAOM); East Copper Island, *CST22251;* Sandspit, *CST23210;* islet off Alliford Bay, *CST23229;* Gray Bay, *CST23420;* Fairfax Inlet, *CT23546A*, *CT23619;* Horn Rock, *CT36518*, Aug. 9, 1957, *Mills;* Kaisun, *CT36536;* Gowdas Islands, *CT36571.*

The relationship of the North American west-coast population to the Atlantic one has been variously interpreted. Mathias and Constance (1945, p. 191) in their treatment of the Umbelliferae in *North American Flora* recognize both coastal populations as belonging to a single taxon, *C. chinense* (L.) B.S.P. Later authors of Pacific Northwest floras, e.g., Hultén, and Hitchock *et al.*, have separated the two populations and applied a different name to the Pacific entity. The application of *C. benthami* by Hultén to the west-coast population is unfortunate, for, as he states in his nomenclatural discussion, its typification is

obscure. Cronquist (*in* Hitchcock *et al.*, 1961, p. 524) considers our plant to be *C. pacificum*, a species described by Watson from a single California station just north of San Francisco. This undoubtedly represents the name for the entity, but the original description does not fully describe the variation within the coastal population.

Although the nomenclatural problems besetting this Pacific population are somewhat confusing, we are in agreement with both these authors in recognizing the western coastal entity as distinct from the Atlantic one. Recent correspondence with Dr. R. Alava of Turku, who is engaged in a worldwide study of *Conioselinum*, confirms this view. Dr. Alava states that in *C. pacificum* "the mericarps are longer and narrower, the number of oil canals is different and the morphology and anatomy of the leaves are quite different from those of the East Coast populations." In addition to having these morphological differences, *C. pacificum* is apparently a tetraploid, whereas *C. chinense* is diploid.

Conioselinum pacificum is widely distributed along the extensive coastline of the Queen Charlotte Islands.

Glehnia

420. Glehnia littoralis Schmidt ssp. **leiocarpa** (Mathias) Hult., Fl. Alaska & Yukon 7: 1180. 1947.

G. littoralis sensu Henry, Fl. South. B.C. 223. 1915.

G. leiocarpa Mathias, Ann. Missouri Bot. Gard. 15: 95. 1928.

GRAHAM ISLAND: mouth of Sangan River, *CST21146* (DAOM), *CST22769;* Tlell, *CST21808*, *CST22105*, *CT35438*, June 8, 1952, *Pillsbury* (UBC), *Cowan* (UBC); Masset Spit, *CST22645;* Jungle Beach, *CST23389;* mouth of Oeanda River, *CT35882;* Masset, Sept. 1911, *Newcombe* (V).

MORESBY ISLAND: Sandspit, *CST23226*, *CT35155*.

The North American population of *Glehnia*, which extends from the Kodiak Islands in Alaska to California, was considered for many years to be identical with the Asiatic *G. littoralis* Schmidt. However, in 1928, the American plant was recognized by Mathias (1928) as a distinct species, *G. leiocarpa*, on the basis of its essentially glabrous fruits in contrast to its pubescent-fruited Asiatic counterpart. Upon examining a series of collections from Alaska and British Columbia we observed that immature fruits have multicellular hairs on the margins of their wings, but at maturity some of the fruits in any one collection are usually glabrous while others have scattered inconspicuous hairs. Some Asiatic specimens have glabrous fruits, but these, unlike the fruits of glabrous-fruited North American plants, are tuberculate. As the differentiation between *G. littoralis* and *G. leiocarpa* is based almost entirely on one variable fruit character we prefer to follow Hultén in recognizing our plant as a race of *G. littoralis*.

On the Islands, *Glehnia* is restricted to sand beaches and dunes and consequently is absent over considerable stretches of the coastline where the shores are bordered by steep cliffs, mud flats, or other unsuitable habitats. All stations

recorded, with the exception of an isolated population from Sandspit, are from the northeastern section of Graham Island. It is notably absent from the large crescent sand beaches at Woodruff Bay on Kunghit Island and at Lepas Bay at the northeastern tip of Graham Island.

Heracleum

421. Heracleum lanatum Michx., Fl. Bor.-Amer. 1: 166. 1803.
H. maximum Bartr., Trav. 344. 1791, *nomen illegitimum.*

GRAHAM ISLAND: 2½ mi S of Tlell, *CST21344;* McClinton Bay, *CST21667* (DAOM); Jewell Island, *CST22459;* Langara Island, *CST22557*, June 1, 1952, *Guiget* (V); Tow Hill, *CST22656*, *CTS34758;* Dawson Inlet, *CST22852;* Mamin River Delta, *T128*, *S3502* (DAOM), *CT35540;* 6 mi S of Juskatla, *CT35486;* Dawson Harbour, June 24, 1897, *Newcombe* (CAN).

MORESBY ISLAND: Sandspit *CST21822;* Mt. de la Touche, *CT23544;* Cumshewa, April 1901, *Newcombe* (V); Skedans, April 1901, *Newcombe* (V).

Heracleum lanatum is common throughout the Queen Charlotte Islands in grassy clearings and other open habitats, especially near the coast, where it often forms extensive colonies in meadows along the upper limits of the beaches. It occurs in subalpine clearings in the Queen Charlotte Ranges and occasionally extends well above tree line in protected runnels. As it produces abundant seed it is capable of rapidly invading disturbed ground. Along the airport runways at Sandspit it has apparently been well established for a number of years.

Ligusticum

Root crowns fibrous; leaves ternately pinnate, the leaflets conspicuously serrate..... *L. calderi*
Root crowns not fibrous; leaves biternate, the leaflets crenate-dentate..... *L. scoticum*

422. Ligusticum calderi Math. & Const., Bull. Torrey Club 86: 374. 1959.

GRAHAM ISLAND: between Ells and Mercer pts., *CST22907B;* Newton Pt., *CST22986;* Shields Bay, *CT23323*, *CT23380;* Jalun Lake, *CT35634.*

MORESBY ISLAND: Chaatl Narrows, *CST21780;* Echo Harbour, *CST22351;* Takakia Lake, *CST23101*, *CT36289*, June 17, 1960, *Foster & Joslin* (UBC); Mt. de la Touche, *CT23546B* (Holotype); Mosquito Mtn., *CT23690*, July 13, 1961, *Foster & Bigg* (UBC); Bigsby Inlet, *CTS34903;* Mt. Moresby, *CT35312*, *CT36421;* Yatza Mtn., *CT35728;* Mt. Russ, *CT36166;* Sunday Inlet, *CT36612.*

This endemic umbel of the Queen Charlotte Islands and neighboring

Banks Island has been fully discussed by Mathias and Constance (1959). During the course of the 1957 survey we confused this species with the widespread coastal *Conioselinum pacificum* (S. Wats.) Coult. & Rose, but, as Mathias and Constance have pointed out, *L. calderi* can be readily distinguished by the presence of its fibrous root crown.

This species is found on boggy slopes, in rocky habitats, and on alpine heaths from near sea level to alpine summits in the Queen Charlotte Ranges. In contrast, *Conioselinum pacificum* is a species of sea beaches and rocky outcrops at the shoreline. On the west coast the two species may occur in close proximity on rock bluffs and cliffs. In addition to the locations cited it was seen on the north shore of Chaatl Island (Schofield, pers. comm.).

423. Ligusticum scoticum L., ssp. **hultenii** (Fernald) Calder & Taylor, Can. J. Bot. 43: 1396. 1965.

L. scoticum sensu Henry, Fl. South. B.C. 223. 1915; *sensu* Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 62. 1921.

L. hultenii Fernald, Rhodora 32: 7. 1930.

GRAHAM ISLAND: Lina Island, *CST22921;* 1½ and 2½ mi S of Jungle Beach, *CST23461*, *CT36694;* Long Inlet, July 26, 1897, *Newcombe* (CAN); Skidegate, May 1901, *Newcombe* (V).

MORESBY ISLAND: Chaatl Narrows, *CST21778;* head of Cumshewa Inlet, *CST21988*, *CT36241.*

Ligusticum scoticum occurs on both the Atlantic and Pacific coasts of North America. Fernald (1930*b*) considered the western plant a distinct species, *L. hultenii.* He separated *L. hultenii* from *L. scoticum* on the shape and size of the umbels, the shape of the fruit, the presence or absence of conspicuous areolate venation on the lower surfaces of leaves, the type of serration and the shape of the leaflets. However, the only reliable characters we have found for separating the two taxa are leaf shape and type of leaf serration. In ssp. *hultenii* the leaflets are usually smaller, more rounded and crenate-dentate in comparison to those of ssp. *scoticum*, which are usually narrower, more conspicuously cuneate at the base, more divided and with serrate-dentate margins. Although the differences are slight, we believe the two populations are sufficiently distinct to merit formal recognition at subspecific rank. Individual collections are sometimes difficult to assign correctly to one subspecies or the other, but only 5 to 10 percent of the large series we have examined are in this category.

Hultén (1958, p. 294) treated *L. hultenii* at subspecific rank, but the combination was published contrary to Article 33 of the 1961 Code.

Ligusticum scoticum is strictly a coastal species on the Queen Charlotte Islands, found along the upper limits of the sand-gravel beaches and on bluffs and rocky exposures at the shoreline. The few collections cited are not indicative of its occurrence on the Islands for it was noted in a number of places along the coast from Henslung Bay (Langara Island) in the extreme northwest to Skincuttle Inlet near the south end of Moresby Island.

Lilaeopsis

424. Lilaeopsis occidentalis Coult. & Rose, Bot. Gaz. 24: 48. 1897.
L. lineata var. *occidentalis* Jepson, Madroño 1: 139. 1923.

GRAHAM ISLAND: Yakoun River Delta, *CST23506*, *CT35468;* Kumdis River Delta, *CT23803;* Mamin River Delta, *S3524;* Delkatla Inlet, *CT35587;* Pure Lake, *CT36102;* Yakoun Lake, *CT36746;* Yakan Pt., *CT36817.*

MORESBY ISLAND: Skidegate Lake, *CT36064;* Mosquito Lake, *CT36719.*

Lilaeopsis occidentalis is locally common on saline, muddy-margined flats and in runnels of the deltas of the Yakoun, Kumdis and Mamin rivers in Masset Inlet. In these places it is restricted to the zone below high tide mark where the habitat is relatively stable and the competition from other halophytes is not significant. In Delkatla Inlet near Masset and at Yakan Point it was collected in brackish meadows some distance from the shoreline. It is unlikely that this species will be found along the exposed outer coastline where wave action is often severe and frequent storms rapidly erode and alter fine sediments. Four of the collections are from the margins of freshwater lakes, where it occurs on a sandy or muddy bottom in shallow water up to about one foot deep. These records extend its range about 250 miles northward from a station near Cape Scott at the northwest tip of Vancouver Island (Hansen Lagoon, *Calder & MacKay 31355*).

In their treatments of the North American Umbelliferae, Coulter and Rose (1900, p. 124) cite a Meehan collection from Alaska, but do not give an exact locality. Mathias and Constance exclude Alaska from its range. The many records from the northern section of the Charlottes indicate that *Lilaeopsis* may occur in the southern part of the Alaska panhandle.

Oenanthe

425. Oenanthe sarmentosa Presl in DC., Prodr. 4: 138. 1830.

GRAHAM ISLAND: Delkatla Inlet, *CST22757;* Queen Charlotte City, *CST23039;* between Lawn Pt. and Tlell, *CST23268;* Juskatla, *S3510;* Honna River, *CT35410;* Tlell, *CT35925;* Skidegate, July 1897 and May 30, 1923, *Newcombe* (V).

MORESBY ISLAND: Sheldens Bay, *CST23436;* Pacofi Bay, *Foster & Joslin 87A* (UBC); Cumshewa, May 1901, *Newcombe* (V); Lockeport, Sept. 7, 1923, *Newcombe* (V); Thurston Harbour, Sept. 12, 1923, *Newcombe* (V).

The essentially coastal *O. sarmentosa* extends from the northern part of the Alaska panhandle south to California, and in British Columbia it extends short distances inland in the lower Fraser and Skeena river valleys. On the Charlottes it is common in moist habitats in and along the margins of open woods and in wet meadows at low elevations.

OSMORHIZA

Leaves hirsutulous to hirsute; flowers greenish white; fruit tapering at the apex; stylopodium conic . . . . . *O. chilensis*
Leaves glabrous or rarely hirsutulous; flowers purplish; fruit constricted near the apex; stylopodium depressed *O. purpurea*

426. Osmorhiza chilensis H. & A., Bot. Beech. Voy. 26 ; 1830.
O. divaricata Nutt. ex T. & G., Fl. N. Amer. 1: 639. 1840.
O. nuda Torr., Pacif. R. R. Rep. 4: 93. 1857.
O. brevipes Suksd., Allg. Bot. Zeits. 12: 5. 1906.

GRAHAM ISLAND: Tlell, *CST21365*, *CST21805*, *CTS34641;* near Skidegate Village, *CST21427;* west of Queen Charlotte City, *CST22472* (DAOM); Masset Spit, *CST22644;* Mamin River Delta, *T119;* Image Pt., *CTS34693;* Haida Pt., *CT35424;* Long Inlet, *CT35974;* July 25, 1897, *Newcombe* (CAN); Mamin River, June 2, 1952, *Schmidt;* Skidegate, July 1897 and June 1901, *Newcombe* (V).

MORESBY ISLAND: between Sandspit and Cape Chroustcheff, *CST20984* (DAOM); Sandspit, *CST21097;* head of Cumshewa Inlet, *CST21965*.

Osmorhiza chilensis is common on light sandy soils in and along the margin of open coniferous woods. It is strictly a lowland species that is never found far from the shoreline in Skidegate Inlet or along the coasts of eastern Graham and northeastern Moresby islands. In comparison to *O. purpurea* it has acute rather than acuminate leaflets, which are less prominently serrated and incised. In the Charlottes the two species occupy quite different habitats, have distinct ranges, and can be readily distinguished by vegetative parts alone.

427. Osmorhiza purpurea (Coult. & Rose) Suksd., Allg. Bot. Zeits. 12: 5. 1906.

GRAHAM ISLAND: Empire Anchorage, *CS21494;* McClinton Bay, *CST21660;* Dawson Inlet, *CST22858*, *CTS35113;* Blackwater Creek, *T47;* near Yakoun River 16 mi S of Juskatla, *CT35495;* Jalun Lake, *CT35614;* Naden Harbour, *CT36845;* Mamin River, May 30, 1952, *Schmidt;* Skidegate, July 1897 and May 24, 1923, *Newcombe* (V).

MORESBY ISLAND: Takakia Lake, *CST23117;* Mt. de la Touche, *CT23591;* Bigsby Inlet, *CTS34908;* between Cumshewa and Peel inlets, *CT35208*.

Osmorhiza purpurea is common in the Queen Charlotte Ranges and the humid forests along their eastern flanks. It is usually found at low elevations on river flats, but occasionally extends to tree line where it occurs in runnels and other protected situations.

This species does not occur at Skidegate. The Newcombe collection, which is labeled "woods in the mountains, Skidegate," probably came from near Slatechuck Mountain about ten miles to the west.

Sanicula

428. Sanicula crassicaulis Poepp. ex DC., Prodr. 4: 84. 1830.
S. menziesii H. & A., Bot. Beech. Voy. 347. 1838.

GRAHAM ISLAND: between Skidegate and Skidegate Village, *CST21402, CST21707;* Torrens Island, *CST22436;* Image Pt., *CTS34672, CT35382;* Skidegate, June 1, 1914, *Green* (UBC).

Bell (1954), in a study of the *S. crassicaulis* complex, found that the species is composed of three polyploid series. The only morphologically distinct segregate in these series is var. *tripartita* (Suksd.) Wolff, which is "the northern octoploid" of eastern Washington and Oregon. Bell demonstrated quite clearly that the tetraploid and hexaploid series cannot be segregated morphologically.

Sanicula crassicaulis has a very limited distribution on the Islands. It is restricted to a few open rocky bluffs along the shoreline near Skidegate and is found in similar habitats on nearby Torrens Island. On the bases of cytological examination of meiosis and measurement of pollen size, the Queen Charlotte Island population is tetraploid.

Cornaceae

Cornus

Small, rhizomatous, herbaceous perennials with large, white, petal-like involucres; fruit red ..... *C. unalaschkensis*
Shrubs up to 6 m high, involucres inconspicuous; fruit white ..... *C. stolonifera*

429. Cornus stolonifera Michx., Fl. Bor.-Amer. 1: 92. 1803.
C. occidentalis (T. & G.) Coville, Contr. U.S. Nat. Herb. 4: 117. 1893.
C. sericea, as to North American plants.

GRAHAM ISLAND: near Skidegate Village, *CST23412;* near Yakoun River 4½ mi S of Port Clements, *CTS35028;* near junction of Yakoun River and Ghost Creek, *CT35508;* Yakoun Lake, *CT36783;* Tlell, June 2, 1951, *Cowan* (UBC); Skidegate, July 7, 1897, *Newcombe* (CAN, V).

MORESBY ISLAND: Sandspit, *CST21817, CST23208, CT35350;* between Copper Bay and Skidegate Lake, *CT23671;* mouth of Deena River, *CT23778.*

The highly polymorphic *C. stolonifera* complex has been a subject of interest to a number of systematists. Although many entities have been described there has never been a definitive biosystematic study of the North American material in conjunction with the closely related taxa that occur in Europe and Asia. Fosberg (1942) and Rickett (1944) both discuss the nomenclatural problems found in the complex, but they have contributed little to our understanding of the biological concepts of speciation in the group. Both have recognized a number

of subspecific taxa on the basis of highly variable characters. Rickett has separated *C. stolonifera* into two distinct species based on the type of leaf pubescence, length of petals and styles, and type of sculpturing on the endocarp. On the basis of these characters there are some general differences between *individual* populations, but it is most difficult to segregate (field) collections. We do not recognize a distinct western species, *C. occidentalis* (T. & G.) Coville, as Rickett has proposed, but we would agree with Fosberg in keeping all North American material under one species. We prefer, however, to use the epithet *stolonifera* rather than *sericea*, for, as Rickett has pointed out, the latter name, used by Fosberg, would be a continuous source of confusion. After carefully examining our herbarium material we are reluctant to recognize infraspecific segregates of *C. stolonifera* and prefer to leave the problem completely open to some researcher who is willing to undertake a detailed biosystematic analysis.

Cornus stolonifera does not have a widespread distribution on the Charlottes, but is limited to the northeastern and southeastern lowlands of Moresby and Graham islands respectively. On the Queen Charlotte Islands this species has leaves with both appressed-branched and loosely spreading uniseriate hairs on the lower surfaces; the petals are usually 3 to 4 mm long and the style is normally 2 mm in length. Some shrubs reach a height of 6 m and have branches up to 4 cm in diameter.

430. Cornus unalaschkensis Ledeb., Fl. Ross. 2:378. 1844. **Figures 162-164.**

C. canadensis var. *intermedia* Farr, Contr. Bot. Lab. Univ. Pa. 2: 423. 1904; *C. intermedia* (Farr) Calder & Taylor, Can. J. Bot. 43: 1396. 1965.

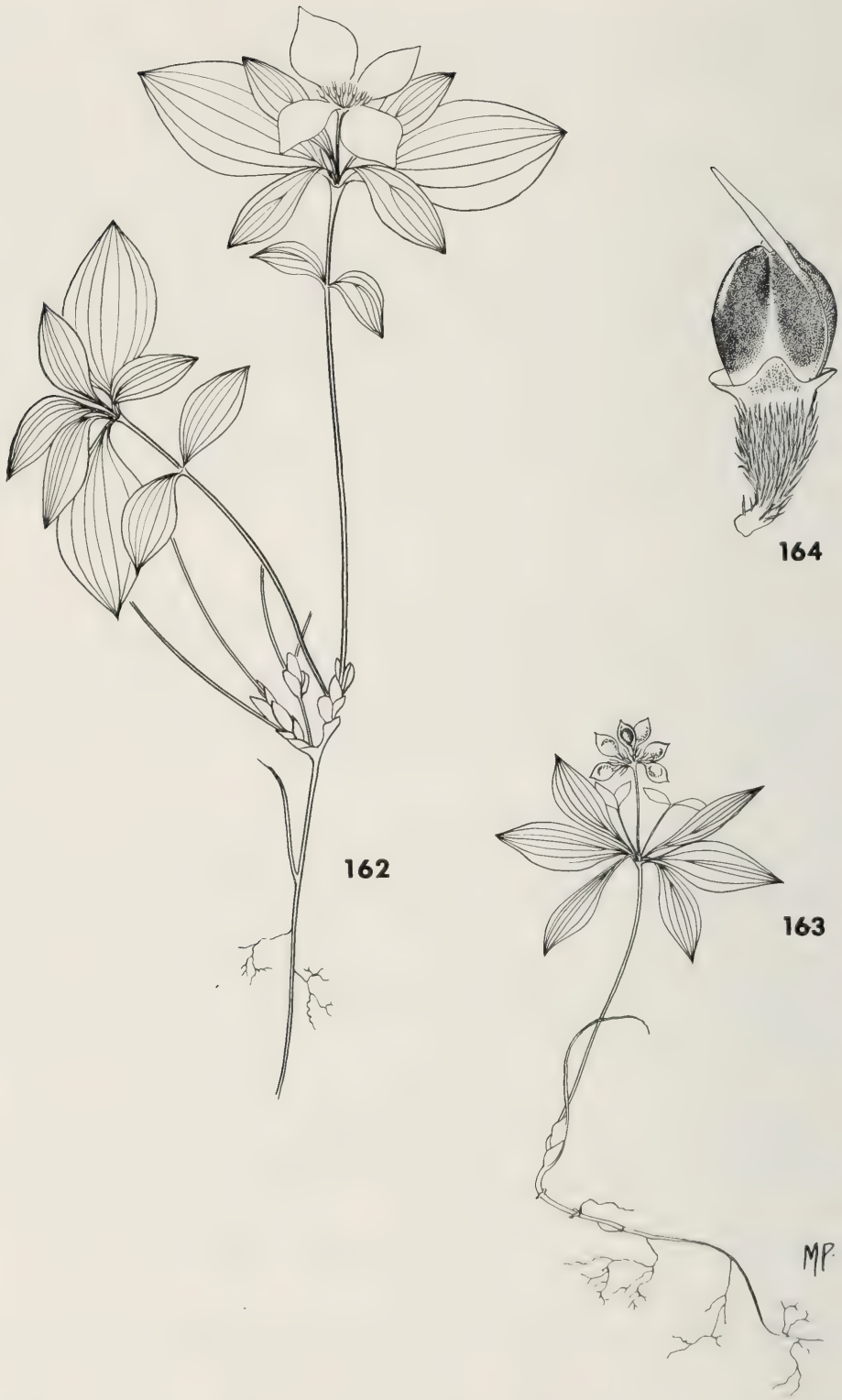
C. canadensis × *suecica* Hult., in part, Fl. Alaska & Yukon 7: 1184. 1947.

C. canadensis sensu Amer. auth., as to western Cordilleran plants.

GRAHAM ISLAND: Queen Charlotte City, *CST20911*, *CST23037;* near Tow Hill, *CST21167*, *CST22703;* near Masset Spit, *CST21240*, *CTS34726;* Empire Anchorage, *CS21510;* Skidegate, *CST21700* (DAOM), June 1901, *Newcombe* (V); Langara Island, *CST22587*, May 21, 1952, *Beebe* (V), June 13, 1956, *Widdowson* (UBC); 3 mi NW of Tlell, *CST23490;* about 10 mi SSE of Juskatla, *T8;* Marie Lake, *T90;* 5 mi N of Port Clements, *CTS34696;* 14½ mi S of Masset, *CT36900;* near Juskatla, June 7, 1952, *Schmidt;* Dawson Harbour, June 24, 1897, *Newcombe* (CAN).

MORESBY ISLAND: head of Cumshewa Inlet, *CST20958;* Chaatl Narrows, *CST21744;* 3 mi S of Copper Bay, *CST21886;* Bigsby Inlet, *CST22154;* Anna Inlet, *CTS34973;* between Cumshewa and Peel inlets, *CT35200;* Upper Victoria Lake, *CT35809;* Kootenay Inlet, *CT36216;* Copper Bay, *Foster & Joslin 11* (UBC); Takakia Lake, *Foster & Joslin 49, 66* (UBC).

The recognition of the distinctive western Cordilleran plant as a separate species from *C. canadensis* L. and *C. suecica* L. has been discussed by Calder and Taylor (1965) under the epithet *intermedia* (Farr.) Calder & Taylor. Our recognition of this epithet was unfortunate because the previously described *C. unalaschkensis* by Ledebour has priority and we are now recognizing it as the valid



Figures 162–164. *Cornus unalaschkensis* Ledeb. 162. Habit of flowering plant from meadow forest (× ½). 163. Habit of fruiting plant from open raised bog (× ½). 164. Flower (× 10).

name for the entity. The population of *C. unalaschkensis* from the Queen Charlotte Islands is quite consistent with respect to flower, fruit and leaf venation characteristics and to general phyllotaxis in relation to the mainland population.

It is a wide-ranging species on the Islands and can apparently tolerate many diverse ecological niches from sea level to subalpine meadows. Plants growing in open bogs tend to be more depauperate than those in the adjacent forested regions. Abundant fruit set was observed on most mature plants.

Pyrolaceae

Plants lacking chlorophyll; leaves scalelike; stems fleshy.	*Hypopitys*
Plants with well-developed green leaves; stems never fleshy	
Flowers solitary	*Moneses*
Flowers in a raceme	*Pyrola*

Hypopitys

431. Hypopitys monotropa Crantz, Inst. 2: 467. 1766.

Monotropa hypopithys L., Sp. Pl. 1: 387. 1753; *H. hypopites* (L.) Small, Mem. Torrey Club 4: 137. 1893.

M. fibriata (A. Gray) Howell, Fl. NW. Amer. 429. 1901.

H. brevis Small, N. Amer. Fl. 29: 13. 1914.

M. latisquamea (Rydb.) Hult., Fl. Alaska & Yukon 8: 1216. 1948.

GRAHAM ISLAND: McClinton Bay, *CST21569;* Towustasin Hill, *CT35520;* Juskatla, June 16, 1952, *Schmidt;* Masset, Aug. 1929, *Young* (V); Yakoun Lake, Aug. 1895, *Newcombe* (V).

MORESBY ISLAND: Gray Bay, *CST23422;* mouth of Deena River, *CT23768;* Mosquito Mtn., *CT36452;* Heater Harbour, July 24, 1959, *Brown* (V).

We are in agreement with Copeland (1941) that *Hypopitys* is generically distinct from *Monotropa* on the basis of pollen, floral and stem morphology.

This species occurs in small, localized populations in the lowland coniferous forests, and Carter and Newcombe (1921) report it to be generally distributed on the Islands. The collections cited are near the northern limit for the species. Only seven localities are reported for the Alaska panhandle by Hultén.

Moneses

432. Moneses uniflora (L.) Gray ssp. **reticulata** (Nutt). Calder & Taylor, Can. J. Bot. 43: 1397. 1965.

M. reticulata Nutt., Trans. Amer. Phil. Soc. II. 8: 271. 1843; *M. uniflora* var. *reticulata* (Nutt.) Blake, Rhodora 17: 28. 1915.

GRAHAM ISLAND: 4 mi E of Masset, *CST21133;* Tow Hill, *CST21189;* 5 mi S of Masset, *CST21279;* Jungle Beach, *CST21394, CTS34669;* Empire Anchorage, *CS21447;* Yakoun River Delta, *CST21546;* McClinton Bay, *CST21568;* Langara Island, *CST22520,* June 1, 1952, *Guiget* (V); Dawson Inlet,

CST22857, *CTS35112;* 10 mi SSE of Juskatla, *T9;* Blackwater Creek, *T51;* 4 mi S of Juskatla and Gold Creek, June 13, 1952, *Schmidt;* Masset, Sept. 25, 1912, *Green* (UBC); Skidegate, 1897, *Newcombe* (V).

MORESBY ISLAND: head of Cumshewa Inlet, *CST21044;* East Copper Island, *CST22199;* mouth of Deena River, *CT23781;* Limestone Island, *CTS34810;* Anna Inlet, *CTS34961;* Church Creek, June 16, 1952, *Pillsbury* (UBC); Canoe Channel, June 23, 1897, *Newcombe* (CAN); Peel Inlet, *Foster & Joslin 4* (UBC).

We have examined about 250 collections of *M. uniflora* from North America and Europe, and agree with a statement of Blake (1915) that the Pacific coast race, ssp. *reticulata*, can only be distinguished from ssp. *uniflora*, "in its more ovate less orbicular acute or acutish leaves serrate-dentate rather than crenate." The shape of the sepals, length of the anthers, and diameter of the capsules, which were considered significant in separating the two taxa by Nuttall (*loc. cit.*) and some other authors, are unreliable characters. The prominence of the reticulate leaf venation in ssp. *reticulata* has also been stressed, and although the venation is prominent in almost all plants from the Pacific coast, it also occurs in many collections from other parts of North America and Europe.

In Alaska and northern British Columbia ssp. *reticulata* is strictly coastal, but in the southern part of the province it is isolated in the interior in the Selkirk and Columbia mountains. This distribution pattern is typical for a number of species that are essentially coastal in the northern part of their ranges in western North America. Subspecies *reticulata* is a weak entity that intergrades with ssp. *uniflora* where the two races meet east of the Coast Mountains in British Columbia. A few collections from the Maritime Provinces of Eastern Canada closely approach ssp. *reticulata.*

Moneses uniflora is one of the dominant species of the climax spruce–hemlock forest throughout the Queen Charlotte Islands.

Pyrola

433. Pyrola secunda L., Sp. Pl. 1: 396. 1753.
P. secunda var. *obtusata* Turcz., Fl. Baic.-Dah. 2: 213. 1856.

GRAHAM ISLAND: Yakoun Lake, Aug. 1895, *Newcombe* (V).

Pyrola secunda is a widely distributed plant throughout boreal regions of North America. In western North America it is found in coniferous woods from Mexico to Alaska. One poorly defined variety, var. *obtusata*, is often recognized, but if a large series of specimens are examined there seems little justification for its retention.

Pyrola is a common genus on the adjacent mainland, but on the Queen Charlotte Islands it is represented by a single species, for which there is only one record. We were aware of this Newcombe record before surveying the Islands, but we were unable to rediscover this species. There seems to be no apparent

reason for the scarcity of *P. secunda* on the Islands because many suitable habitats are available and it is found in the adjacent panhandle of Alaska and on Vancouver Island to the south.

Ericaceae

Largest leaves over 2 cm long
  Leaves distinctly pubescent
    Leaves revolute, furrowed on upper surface, conspicuously white to rusty tomentose on lower surface ..... *Ledum*
    Leaves flat, not furrowed on upper surface, never white to rusty tomentose on lower surface
      Upper surfaces of leaves strigose; fruit a capsule... *Menziesia*
      Upper surfaces of leaves puberulent; fruit a berry.. *Vaccinium*
  Leaves essentially glabrous
    Leaves distinctly glaucous on lower surface
      Leaves alternate; corolla globose-urceolate..... *Andromeda*
      Leaves opposite; corolla rotate..... *Kalmia*
    Leaves green on lower surface
      Largest leaves less than 3 cm long
        Leaves revolute, linear to narrowly elliptic..... *Andromeda*
        Leaves flat, ovate, elliptic, oblanceolate, or obovate to spatulate
          Leaves evergreen, thick, coriaceous..... *Arctostaphylos*
          Leaves deciduous, membranaceous..... *Vaccinium*
      Largest leaves more than 3 cm long
        Leaves entire
          Largest leaves less than 2 cm wide; branches never distinctly angled; fruit a capsule... *Cladothamnus*
          Largest leaves more than 2 cm wide, if less, branches distinctly angled; fruit a berry.. *Vaccinium*
        Leaves serrulate
          Leaves evergreen, thick, coriaceous..... *Gaultheria*
          Leaves deciduous, membranaceous..... *Vaccinium*
Largest leaves less than 1.5 cm long
  Leaves scale- or needle-like
    Leaves needlelike with glandular protuberances along the margins..... *Phyllodoce*
    Leaves scale- or needle-like, glabrous or with a tuft of hairs at the apex..... *Cassiope*
  Leaves not scale- or needle-like
    Stems puberulent, if glabrous the leaves neither glaucous nor conspicuously pubescent on lower surface, nor conspicuously revolute; fruit a berry.. *Vaccinium*

Stems glabrous; leaves either glaucous (occasionally green) or conspicuously pubescent on lower surface, strongly revolute; fruit a capsule
Largest leaves less than 1 cm long..... *Loiseleuria*
Largest leaves more than 1 cm long..... *Andromeda*

434. Andromeda polifolia L., Sp. Pl. 1: 393. 1753.
A. polifolia var. *concolor* Boivin, Can. Field-Nat. 65: 16. 1951.

GRAHAM ISLAND: about 3 mi NW of Tlell, *CST20940*, *CST23494;* near Tow Hill, *CST21171*, *CST21337A* (DAOM); between Tow Hill and Rose Spit, *CST21214;* 7½ mi S of Masset, *CST21251;* Empire Anchorage, *CS21479;* Tan Mtn., *CST21606;* Newton Pt., *CST22980;* 7 mi N of Port Clements, *CTS34704*, *CTS34705;* Dawson Inlet, *CTS35098;* Jalun Lake, *CT35676;* Langara Island, May 12, 1952, *Beebe* (V-mixed with *Kalmia polifolia*); Masset, Aug. 25, 1912, *Green* (UBC); Tlell, June 2, 1951, *Cowan* (UBC); Port Clements, 1935, *Ashford* (V).

MORESBY ISLAND: Echo Harbour, *CST22338;* Upper Victoria Lake, *CT35793;* Chaatl Narrows, June 12, 1959, *Brown* (V); south of Tasu Sound, June 1, 1960, *Brown* (V).

Andromeda polifolia is closely related to but quite distinct from *A. glaucophylla* Link of eastern and central North America. It is characterized by leaves that vary from glaucous to green and glabrous beneath, inflorescences of few flowers in open clusters and flowers with upright straight pedicels (especially evident in mature fruit). Hultén (1948, p. 1242) in his *Flora of Alaska and Yukon* considers the eastern plant to be a race of *A. polifolia*, but there is good morphological evidence for maintaining these two geographical entities as distinct species. In *A. glaucophylla* the leaves are whitish beneath with a close minute puberulence, the inflorescences are usually many flowered in dense drooping clusters, and the pedicels are arcuate. The flowers also tend to be smaller and the pedicels are shorter than in *A. polifolia*. Where the two species meet in the Hudson Bay – James Bay region intermediates (*A.* × *jamesii* Lepage) occur.

Andromeda polifolia var. *concolor* is merely a form with green leaves that are glaucous beneath. Such plants occur sporadically throughout western Canada, Alaska and Scandinavia. Colonies containing both leaf types and intermediates were noted in the Queen Charlotte Islands.

In the large series of specimens we have examined from Alaska, Yukon and British Columbia, we find no evidence of a broad-leaved coastal race and a narrow-leaved inland one which Hultén considers to exist. In fact, many of the collections from central interior British Columbia are much broader leaved than plants from Vancouver Island and the Queen Charlotte Islands.

This species is widely distributed throughout British Columbia. It is rare in the southern part of the province but common northward from the latitude of Prince George and Prince Rupert. We found it in almost all the bogs that we sur-

veyed in the extensive lowland muskegs of northeastern Graham Island. It is rare on Moresby Island, but occurs sporadically on boggy mountain slopes to at least 1,700 ft in the Queen Charlotte Ranges.

435. Arctostaphylos uva-ursi (L.) Sprengel, Syst. 2: 287. 1825.
A. uva-ursi var. *pacifica* Hult., Fl. Alaska & Yukon 8: 1249. 1948.

GRAHAM ISLAND: Haida Pt., *CST20874*, *CST23453;* Torrens Island, *CST22449;* Yakoun Lake, Aug. 1895, *Newcombe* (V).

MORESBY ISLAND: Hotspring Island, *CST22287;* Limestone Island, *CST22407;* South Low Island, *CTS34835;* Skedans, Sept. 14, 1902, *Newcombe* (V).

Fernald and Macbride (1914, p. 211) in a treatment of *A. uva-ursi* for North America recognized three varieties distinguished as follows: (1) var. *uva-ursi*, young branchlets minutely tomentulose and viscid, but soon becoming glabrate; (2) var. *coactilis* Fern. & Macbr., young branchlets permanently white-tomentulose, never viscid; and (3) var. *adenotricha* Fern. & Macbr., branches and petioles viscid-puberulent, the pubescence mixed with black stipitate glands. It has not been practical for us to examine the large series of this species in the herbarium of our institute, but we have carefully checked the 120 odd collections from Alaska, Yukon and British Columbia. Two phases that we recognize as subspecies occur in this region. All plants from Yukon, interior northern British Columbia and interior Alaska, including the central part of the Kenai Peninsula, have young branchlets that are viscid-puberulent, often with conspicuous stipitate glands. This glandular phase is clearly ssp. *adenotricha* (Fern. & Macb.) Calder & Taylor, which Fernald and Macbride reported from Quebec, Saskatchewan, British Columbia and Montana. It is common across the north to the Atlantic coast and extends sporadically southward to the Gulf of St. Lawrence, the Port Arthur area at the head of Lake Superior, and northern Minnesota. The distribution is wider than the map compiled by Raup (1947, *pl.* XXXIII) indicates. We have not seen any of this subspecies with black stipitate glands and we strongly suspect that plants so described are merely extremely glandular individuals with dirt adhering to the glands. In the more southern parts of British Columbia both at the coast and in the interior ssp. *adenotricha* usually occurs at high elevations in the subalpine or alpine zones.

As pointed out by Fernald and Macbride, the European plant, ssp. *uva-ursi*, has sparsely puberulent young branchlets that soon lose most of their pubescence. Such plants also occur in North America, but a more common phase (var. *coactilis*) that appears to be restricted to this continent has a denser white puberulence that is persistent for at least a few years. Both types occur in British Columbia, but they are not readily separable and intermediates are frequent. The situation is further confused by the presence of minute scattered glands on the branchlets in a number of the lowland collections from southern British Columbia that would seem to indicate introgression with ssp. *adenotricha*. As

there is so much variation in the degree of pubescence of the young branchlets in the nonglandular North American material, we are provisionally referring all such collections from the Pacific northwest to ssp. *uva-ursi*.

All the collections we have seen from along the Alaska coast, the Queen Charlotte Islands and the adjacent mainland are of the nonglandular type. On Vancouver Island both the glandular and nonglandular phases occur. In addition, where *A. uva-ursi* is found with *A. columbiana* Piper, especially along the southeast coast of the Island, there has been almost complete introgression.

Hultén in his *Flora of Alaska and Yukon* (1948, p. 1249) recognized a minor race, var. *pacifica* Hult., from along the Alaska, British Columbia and Washington coasts. He stated that this race differed from Scandinavian material in having more elliptic leaves, more reddish bracts and distinctly red corollas. We have examined many collections from along the Pacific coast and although plants with elliptical leaves do occur in this region they are also found sporadically throughout the range of *A. uva-ursi*. The reddish coloration of the bracts and corollas was only noted in one collection. Such pigmentation of both floral and vegetative parts is a common phenomenon in a number of species from the coastal region (e.g. *Luetkea pectinata* (Pursh) Kuntze and *Saxifraga mertensiana* Bong.) and is not a reliable morphological character for the recognition of new taxa.

In the Queen Charlotte Islands *A. uva-ursi* was noted on cliffs along the north shore of Skidegate Inlet from Queen Charlotte City to Skidegate Village and on nearby Jewell and Torrens islands. It is a species of relatively dry, open, rocky bluffs, and is restricted to the east coast of the Charlottes, extending as far south as Hotspring Island in Juan Perez Sound.

On May 24, 1957, we collected specimens with pinkish-white, urceolate flowers at Haida Point near Skidegate. The colonies in this area flowered a second time on August 13, producing bright carmine subcylindric flowers, like those described by Fernald (f. *heterochroma*) from Cape Cod and Nantucket in Massachusetts.

Cassiope

Leaves alternate, spreading, needlelike; flowers solitary, terminal ..... *C. stelleriana*

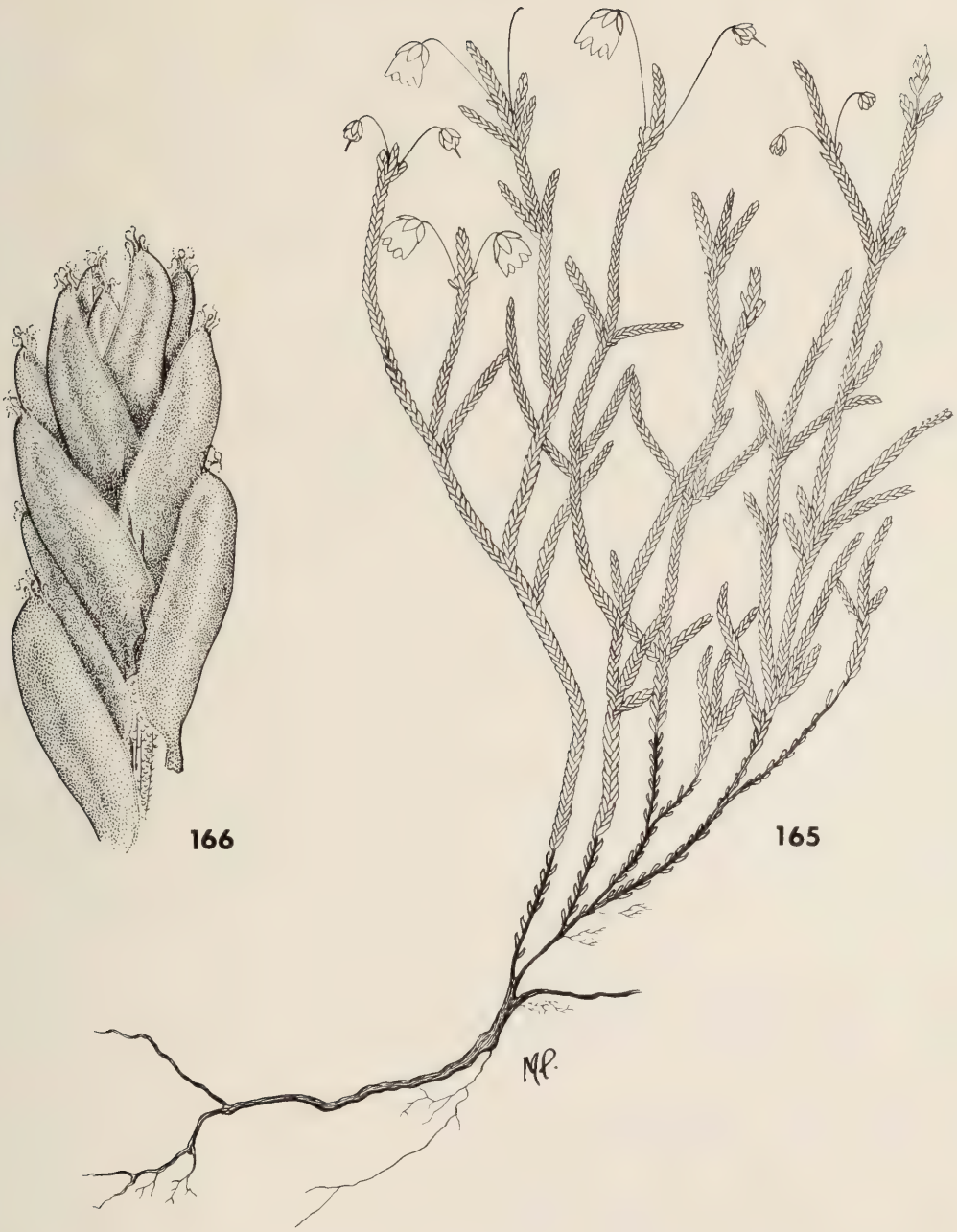
Leaves opposite, appressed, scalelike; flowers several, lateral or subterminal

Leaves scarious margined, in four distinct rows, tips never pilose; fruiting pedicels short and inconspicuous ... *C. mertensiana*

Leaves not scarious margined, not in four distinct rows, tips pilose; fruiting pedicels long and conspicuous .. *C. lycopodioides*

436. Cassiope lycopodioides (Pall.) D. Don ssp. **cristapilosa** Calder & Taylor, Can. J. Bot. 43: 1397. 1965. **Figures 165 and 166.**

GRAHAM ISLAND: Empire Anchorage, *CS21462;* Tan Mtn., *CST21613;*



Figures 165–166. *Cassiope lycopodioides* (Pall) D. Don ssp. *cristapilosa* Calder & Taylor. 165. Habit (× ½). 166. Detail of leaves showing tuft of hairs at tip of each leaf (× 8).

Dawson Inlet, *CST22825*, *CTS35097;* between Ells and Mercer pts., *CST22898;* Newton Pt., CST22950; Shields Bay, *CT23281;* Jalun Lake, *CT35647.*

MORESBY ISLAND: Chaatl Narrows, *CST21795;* Newcombe Peak, *CST22029;* Bigsby Inlet, *CST22172*, *CTS34898;* Echo Harbour, *CST22339;* Mosquito Mtn., *CT23730*, *CT36472;* Anna Inlet, *CTS34950;* Yatza Mtn., *CT35714;* Mt. Moresby, *CT36426;* Sunday Inlet, *CT36585*, *CT36642;* Mike Inlet, *CT36663.*

The distribution of *C. lycopodioides* is restricted to northwestern British Columbia, southern coastal Alaska including the Aleutian Islands, and the northeastern coast of Asia. The Queen Charlotte Islands population represents a distinct race, ssp. *cristapilosa*, distinguished from the typical subspecies by the presence of one to several conspicuously curled unicellular hairs up to 1.5 mm long at the tip of each leaf. This is in contrast to the entirely glabrous-tipped leaves of ssp. *lycopodioides.*

Cassiope lycopodioides ssp. *cristapilosa*, the most common member of the genus on the Islands, was found in nearly all subalpine or alpine habitats that we surveyed. This subspecies is usually at its optimum development in subalpine habitats at low elevations, especially on the extensive open rocky-boggy slopes in and along the flanks of the Queen Charlotte Ranges.

437. Cassiope mertensiana (Bong.) G. Don, Gen. Hist. 3: 829. 1834.

GRAHAM ISLAND: Shields Bay, *CT23353.*

MORESBY ISLAND: Takakia Lake, *CST23097*, *CT36283;* Mosquito Mtn., *CT36512A.*

Cassiope mertensiana is one of the dominant species of heathy alpine slopes on the British Columbia mainland and Vancouver Island, but is apparently rare on the Queen Charlotte Islands. All collections from the Charlottes, mainland British Columbia, and the Alaska panhandle belong to ssp. *mertensiana.*

This species was only collected on the mountain directly north of Mount Stapleton near the head of Shields Bay on the west coast, on open heathy slopes above our 1957 and 1964 camp site at the east end of Takakia Lake, and on Mosquito Mountain west of the head of Cumshewa Inlet.

438. Cassiope stelleriana (Pall.) DC., Prodr. 7: 611. 1839.

GRAHAM ISLAND: Tan Mtn. *CST21600;* Newton Pt., *CST22971;* Shields Bay, *CT23379;* Dawson Inlet, *CTS35133*, Aug. 1961, *Foster & Bigg* (UBC); Jalun Lake, *CT35675;* Mt. Needham area, June 18, 1961, *Foster & Bigg* (UBC).

MORESBY ISLAND: Newcombe Peak, *CST22027;* Takakia Lake, *CST23120A*, *CT36279;* Mosquito Mtn., *CT23744A;* Tasu Sound, June 26, 1961, *Foster & Bigg* (UBC).

Cassiope stelleriana is widely distributed throughout the Queen Charlotte Ranges from near Jalun Lake in northwest Graham Island to Upper Victoria Lake near the southern limit of the mountain chain on Moresby Island. It is usually found on subalpine or alpine knolls and heathy slopes from about 1,500 to 3,000 ft, but occasionally it extends to much lower elevations in protected runnels. It is essentially a coastal montane species, which ranges in North America from the Aleutian Islands to Mount Rainier in Washington. In the northern part of its range it extends inland to the Cassiar Mountains of Yukon and northern British Columbia and to the Alaska Range north of Anchorage. It is not present on Vancouver Island.

Cladothamnus

439. Cladothamnus pyrolaeflorus Bong., Mém. Acad. St. Pétersb. VI. 2: 155. 1832.

GRAHAM ISLAND: Tan Mtn., *CST21612;* Dawson Inlet, *CST22826;* between Ells and Mercer pts., *CST22886;* Shields Bay, *CT23326, CT23371;* Long Inlet, *CT35985;* Yakoun Lake, Aug. 1895, *Newcombe* (V).

MORESBY ISLAND: head of Cumshewa Inlet, *CST22020;* Bigsby Inlet, *CST22145;* Echo Harbour, *CST22353;* Takakia Lake, *CST23116;* Mt. de la Touche, *CT23558;* Mosquito Mtn., *CT23713;* Anna Inlet, *CTS34929;* Upper Victoria Lake, *CT35748;* Mt. Russ, *CT36152;* Mt. Moresby, *CT36422;* Sunday Inlet, *CT36623.*

Cladothamnus pyrolaeflorus is a common shrub 1 to 3 m high that was noted or collected in all areas surveyed in the Queen Charlotte Ranges. At lower elevations it is restricted to open, rocky exposures along stream banks and lake margins; on wooded mountain slopes it is found at the edges of ravines and in runnels; and near tree line it occasionally forms thickets in openings in the hemlock-spruce forest. This species is rarely a dominant element of the vegetation.

Cladothamnus pyrolaeflorus, a distinctive shrub with showy, copper-colored flowers, should be more extensively cultivated.

Gaultheria

440. Gaultheria shallon Pursh, Fl. Amer. Sept. 283. 1814. **Figure 167.**

GRAHAM ISLAND: mouth of Sangan River, *CST21140;* Tlell, *CST21373* (DAOM), *CST21803;* between Skidegate and Skidegate Village, *CST21404, CST21708;* Langara Island, *CST22526;* between Ells and Mercer pts., *CST22901;* Lina Island, *CST22917;* near Juskatla, *S3549;* 2½ mi SE of Port Clements, *CTS34595;* White Creek Muskeg, *CTS34743;* Skidegate, June 1897, *Newcombe* (V), June 30, 1912, *Spreadborough* (CAN).

MORESBY ISLAND: 2½ mi SW of Sandspit, *CST21081;* about 3 mi S of Copper Bay, *CST21887;* head of Cumshewa Inlet, *CST21961;* Bag Harbour, *CST22193;* East Copper Island, *CST22202;* mouth of Deena River, *CT23791;* South Low Island, *CTS34991;* Upper Victoria Lake, *CT35794;* Kootenay Inlet,



Figure 167. *Gaultheria shallon* Pursh growing along forest margin on the south side of Langara Island near Dadens ancient Indian village.

CT36217; Sunday Inlet *CT36625;* Rose Inlet, *CT36995;* Copper Bay, *Foster & Joslin 8* (UBC); Rose Harbour, *Foster & Joslin 87A* (UBC); Ninstints, June 1901, *Newcombe* (V); Little Goose Bay, Sept. 10, 1951, *Pillsbury* (UBC).

Gaultheria shallon is one of the most common and widely distributed shrubs on the Queen Charlotte Islands. It is essentially a lowland species of the more open habitats near the coast, such as bluffs and rocky knolls, but it also occurs at low elevations on mountain slopes of the Queen Charlotte Ranges. In open coniferous forests near the shoreline it often forms almost impenetrable thickets and it rapidly invades logged-over areas.

Except for a few isolated stations along the east shore of Kootenay Lake in the southeastern part of the province, all British Columbia records are from west of the Coast Mountains.

Kalmia

441. Kalmia polifolia Wang., Ges. Nat. Freunde Berlin Schr. 2: 130. 1788.

GRAHAM ISLAND: 3½ mi NW of Tlell, *CST20938, CTS34629;* near Tow Hill, *CST21161;* between Tow Hill and Rose Spit, *CST21215;* 7½ mi S of Masset, *CST21250;* 8 mi SE of Port Clements, *CST21349;* Empire Anchorage, *CS21475;* Tan Mtn., *CST21624;* near Skidegate, *CST21695;* Langara Island, *CST22496*, May 12, 1952, *Beebe* (V-mixed with *Andromeda polifolia);* between Ells and Mercer pts., *CST22904;* Newton Pt., *CST22957;* Shields Bay, *CT23285;* about 9 mi and 10 mi SSE of Juskatla *T63, T3;* 7 mi N of Port Clements, *CTS34702;* Dawson Inlet, *CTS35101*, 1961, *Foster & Bigg* (UBC); Jalun Lake, *CT35686;* near Queen Charlotte City, May 20, 1952, *Schmidt;* Yakoun River, June 10, 1952, *Schmidt;* Tlell, June 2, 1952, *Cowan* (UBC); Yakoun Lake, Aug. 1895, *Newcombe* (V).

MORESBY ISLAND: White Swan Bog, *CST21034;* Chaatl Narrows, *CST21760;* Newcombe Peak, *CST21996;* Bigsby Inlet, *CST22121A;* Echo Harbour, *CST22365;* Takakia Lake, *CST23135, Foster & Joslin 67* (UBC); Anna Inlet, *CTS34951;* Upper Victoria Lake, *CT35771;* Kootenay Inlet, *CT36179;* Mike Inlet, *CT36672;* Mt. Moresby, July 13, 1961, *Foster & Bigg* (UBC).

The North American *K. polifolia* is represented by two subspecies: ssp. *polifolia*, a lowland plant extending from the Atlantic to the Pacific coast, and ssp. *microphylla* (Hook.) Calder & Taylor, which is restricted to the mountains of western Canada and the United States. The former is a taller plant with more strongly revolute leaves and larger floral parts, but the only significant differences between the two subspecies are in leaf shape and size, and in the width-to-length ratio of the leaves. In ssp. *polifolia* the leaves are about 2 to 4 cm long, narrowly elliptic to narrowly ovate and usually much less than half as broad as long; in ssp. *microphylla* they are usually 1 to 2 cm long, essentially elliptic and slightly more to slightly less than half as long as broad.

All the alpine collections of this species that we have examined from British Columbia, western Alberta and Yukon with the exception of those from

the Queen Charlotte Islands belong to ssp. *microphylla*. The essentially lowland ssp. *polifolia* is the only race on the Charlottes. Plants from the British Columbia population of ssp. *polifolia* differ from those of eastern North America in usually having less revolute, slightly longer and broader leaves, but there is no sharp line of distinction between the two populations.

Kalmia polifolia is one of the most common bog species in the Queen Charlotte Islands. It was noted in all such habitats surveyed in the lowlands of Moresby and Graham islands, and was found on boggy slopes and in subalpine meadows to at least 2,000 ft in the Queen Charlotte Ranges.

Ledum

442. Ledum palustre L. ssp. **groenlandicum** (Oeder) Hult., Fl. Alaska & Yukon 8: 1219. 1948.
L. groenlandicum Oeder, Fl. Dan. 4: 5. 1777.

GRAHAM ISLAND: near Tow Hill, *CST21170;* between Tow Hill and Rose Spit, *CST21210;* 7½ mi S of Masset, *CST21249A;* about 8 mi SE of Port Clements, *CST21352;* Empire Anchorage, *CS21461;* near Skidegate, *CST21690;* Langara Island, *CST22497;* between Ells and Mercer pts., *CST22889;* about 9 and 10 mi SSE of Juskatla, *T64, T2;* 3½ mi NW of Tlell, *CTS34614;* White Creek Muskeg, *CTS34738;* Dawson Inlet, *CTS35100;* Yakoun River, June 4 and June 17, 1952, *Schmidt;* Tlell, June 2, 1951, *Cowan* (UBC); Masset, 1902, *Newcombe* (V).

MORESBY ISLAND: Chaatl Narrows, *CST21761;* Bigsby Inlet, *CST22153, CTS34915;* Echo Harbour, *CST22364;* between Gray and Sheldens bays, *CST23439;* Anna Inlet, *CTS34952;* Upper Victoria Lake, *CT35773.*

We have examined nearly 200 collections of *Ledum* from Alaska, Yukon and British Columbia and have arrived at the same conclusions as Hultén (1948, p. 221), i.e., that *L. groenlandicum* Oeder and *L. decumbens* (Ait.) Lodd. should be considered races of a single polymorphic circumboreal species, *L. palustre*. The two subspecies have been separated on such characters as the shape and length of the leaves, number of stamens, presence or absence of pubescence on the filaments, shape of the capsules, and attitude of the pedicels. Typical specimens of the southern ssp. *groenlandicum* have linear-oblong leaves, 5 to 8 stamens, and arcuate fruiting pedicels, in contrast to the more northern ssp. *decumbens* (Ait.) Hult., that has linear leaves, usually about 10 stamens, and fruiting pedicels abruptly hooked at the apex. Capsule length and the presence or absence of pubescence on the lower half of the styles are unreliable characters for separating the two taxa. The more northern ssp. *decumbens* extends southward to the Cassiar District of northern British Columbia, but in this region and southern Yukon it is restricted to alpine habitats, whereas ssp. *groenlandicum* occurs at lower elevations. The two subspecies are sympatric over a broad area in southern Yukon and central Alaska and it is in these regions that intermediates occasionally occur. Savile (pers. comm.) believes that *Ledum groenlandicum* should not be regarded as a subspecies of *L. palustre* for the following reasons.

He has observed that in eastern Canada, the ecological-phenological overlap of the two taxa is very slight in areas of sympatry and he has observed no intermediates. However, according to Savile, in the far northwest, where *L. groenlandicum* tends to be small-flowered, there may be some introgression, but even here the two plants seem to preserve their identities. Savile also noted that even in the northwest *L. palustre* and *L. groenlandicum* take morphologically distinct rusts, *Chrysomyxa ledi* var. *ledi* and var. *groenlandici* respectively, as they do throughout their ranges. It is clear from not only our own research on the two taxa, but also from that of Savile, that two taxa are present and should be recognized. However, the designation of the taxonomic level of these two taxa must await a detailed systematic study of the genus.

All collections of *L. palustre* from the Queen Charlotte Islands are the broad-leaved southern type, ssp. *groenlandicum*. It is common in and at the margins of sphagnum bogs throughout the lowland areas of Graham and Moresby islands. In the Queen Charlotte Ranges it extends to tree line on boggy slopes in open coniferous forest.

Loiseleuria

443. Loiseleuria procumbens (L.) Desv., J. Bot. Appl. 3: 35. 1814.

GRAHAM ISLAND: 3½ mi NW of Tlell, *CST20939;* near Tow Hill, *CST21158, CST21332, CST22716;* Empire Anchorage, *CS21524;* Langara Island, *CST22498*, May 21, 1952, *Beebe* (V); between Ells and Mercer pts., *CST22903;* Newton Pt., *CST22973;* 6½ mi SE of Port Clements, *CTS34618;* White Creek Muskeg, *CTS34747;* Jalun Lake, *CT35681;* Masset, July 1901, *Newcombe* (V), Aug. 26, 1912, *Green* (UBC); Dawson Inlet, Aug. 1961, *Foster & Bigg* (UBC).

MORESBY ISLAND: Chaatl Narrows, *CST21757*, June 12, 1959, *Brown* (V); Bigsby Inlet, *CST22166;* Takakia Lake, *CST23084*, *CT36267*, *Foster & Joslin 54* (UBC); Mosquito Mtn., *CT23738;* Anna Inlet, *CTS34967;* Upper Victoria Lake, *CT35708;* Kootenay Inlet, *CT36158;* Sunday Inlet, *CT36582*.

Loiseleuria procumbens is widely distributed throughout the Queen Charlotte Islands. It is common, but scattered, in the lowland muskegs of Graham Island. On the exposed outer coast it occurs on open, boggy slopes and inland extends above tree line to windswept cols and mountain summits of the Queen Charlotte Ranges. The occurrence of this species in sea level bogs at Prince Rupert, on Hope Island off the north end of Vancouver Island, and in the Queen Charlotte Islands is surprising, for it is essentially a high alpine heath plant in Yukon and Alaska.

Menziesia

444. Menziesia ferruginea Smith, Pl. Icon. Ined. *pl.* 56. 1791.

GRAHAM ISLAND: Tow Hill, *CST21199;* near Masset Spit, *CST21249;* 1½ mi SE of Port Clements, *CST21385;* near Skidegate Village, *CST21433;*

Empire Anchorage, *CS21454;* 3 mi NW of Tlell, *CST22072;* Langara Island, *CST22499*, June 1, 1952, *Guiget* (V); Dawson Inlet, *CST22834*, *CTS35137;* Shields Bay, *CT23329* (DAOM); Millar Creek, *CT23456;* about 10 mi SSE of Juskatla, *T11;* 5 mi N of Port Clements, *CTS34697;* Honna River, *CT35414;* Jalun Lake, *CT35616;* near Juskatla, June 7, 1952, *Schmidt;* Masset, July 1901, *Newcombe* (V); near Skidegate, Aug. 1897, *Newcombe* (V); Dawson Harbour, June 1897, *Newcombe* (V); Skidegate Inlet, June 23, 1897, *Newcombe* (CAN).

MORESBY ISLAND: near Alliford Bay, *CST21067;* Chaatl Narrows, *CST21745;* 3 mi E of Skidegate Lake, *CST21910;* Bigsby Inlet, *CST22132;* between Sandspit and Copper Bay, *CST23201;* between Gray and Sheldens bays, *CST23447* (DAOM); Mt. de la Touche, *CT23614* (DAOM); Richardson Island, *CTS34918;* between Cumshewa and Peel inlets, *CT35203;* Upper Victoria Lake, *CT35819;* Yakulanas Bay, *CT36657;* Rose Inlet, *CT36996;* Limestone Island, May 2, 1901, *Newcombe* (V); Lockeport, May 22, 1923, *Newcombe* (V); Little Goose Bay, Sept. 10, 1951, *Pillsbury* (UBC).

All collections of *M. ferruginea* from the Queen Charlotte Islands can be referred to ssp. *ferruginea.* This coastal race has penetrated the Coast Mountains only in the Skeena and Fraser river drainages. In British Columbia the inland ssp. *glabella* (A. Gray) Calder & Taylor is restricted to the mountains of the southeastern part of the province. The two subspecies can be readily distinguished by the following leaf characters:

ferruginea	**glabella**
elliptic or occasionally obovate, acute, prominently apiculate	essentially obovate, rounded, less prominently apiculate
almost glabrous to conspicuously glandular-pubescent beneath; *never puberulent*	sparsely to conspicuously puberulent beneath; glandular-pubescent but never conspicuously so
usually pale green beneath, rarely glaucous	pale green or glaucous beneath
reticulate venation prominent beneath	reticulate venation obscure beneath

In addition, these two subspecies can be separated by the type and density of the pubescence on the calyces, pedicels and twigs, but the differences are not as evident as those in the leaf characters. In ssp. *ferruginea* the capsules are either glabrous or glandular-pubescent, whereas in ssp. *glabella* they are puberulent with or without glandular hairs. Although the two races are geographically isolated in British Columbia, they apparently freely intergrade in the Cascades of southern Washington and Oregon (Hitchcock *et al.*, 1959, p. 17).

Menziesia ferruginea is one of the most common and widely distributed shrubs on the Islands. It prefers open forest habitats and clearings, but can tolerate the most densely shaded conditions in the climax spruce–hemlock forest. In dense forest it occasionally reaches a height of 3½ m, but under such conditions is straggly and produces few flowers. All collections are from lowland sites but a few stunted shrubs were noted in rocky runnels at about 2,000 ft near our camp site at Takakia Lake. It is surprising that there are not more records

from subalpine habitats in the Queen Charlotte Ranges for it is a common shrub at tree line along the adjacent mainland coast.

Subspecies *ferruginea* is often used as an ornamental in gardens at the coast. It would also be worthwhile to cultivate ssp. *glabella*, which is a smaller, more attractive shrub than its coastal counterpart.

Phyllodoce

445. Phyllodoce glanduliflora (Hook.) Coville, Mazama 1: 196. 1897.

GRAHAM ISLAND: Newton Pt., *CST22976;* Shields Bay, *CT23282, CT23356;* Jalun Lake, *CT35648.*

MORESBY ISLAND: Newcombe Peak, *CST22023;* Bigsby Inlet *CST22162;* Echo Harbour, *CST22347;* Takakia Lake, *CST23069, CT36276, Foster & Joslin 72* (UBC); Mosquito Mtn., *CT23714;* Yatza Mtn., *CT35713.*

There is considerable variation in *P. glanduliflora* throughout its range in British Columbia and Alaska. Plants from the wet coastal belt and from mesophytic habitats in the interior tend to have long, thin, flat leaves with a deep central groove along the adaxial surface, and a prominent, white, finely puberulent central furrow along the abaxial side. In contrast, plants from xerophytic habitats have smaller, thicker, often somewhat arcuate leaves with the groove on the adaxial surface usually shallow and inconspicuous or lacking, and the furrow on the abaxial surface narrow and inconspicuous.

The morphology of the leaf has been discussed in detail by Stoker (1939). It is well-adapted to prevent loss of moisture because the stomata are restricted to the almost closed longitudinal cavities on either side of the abaxial furrow. It seems reasonable to assume that the variation between the two leaf types is merely a reflection of the varying amount of precipitation and relative humidity found throughout its total range.

Phyllodoce glanduliflora is common on subalpine and alpine slopes throughout the Queen Charlotte Ranges, and is found occasionally near sea level on the open, windswept slopes of the west coast.

Vaccinium

Corolla cleft nearly to the base, the lobes strongly reflexed; a trailing vine with red fruit..... *V. oxycoccus*

Corolla shallowly lobed, the lobes conspicuously shorter than the tube and never strongly reflexed

Low creeping, mat-forming shrubs up to about 15 cm high; leaves evergreen; fruit red..... *V. vitis-idaea*

Upright or sprawling shrubs usually over 15 cm high; leaves usually deciduous; fruit red, bluish or blue-black

Branches essentially terete; shrubs to about 30 cm high; fruit glaucous blue

Leaves entire ..... *V. uliginosum*
Leaves serrulate ..... *V. caespitosum*
Branches weakly to conspicuously angled
Margins of leaves strongly serrulate; shrubs usually less than 25 cm high; branches conspicuously angled, bright green, and often in broomlike clusters; fruit reddish or bluish-red ..... *V. scoparium*
Margins of leaves entire, or weakly serrulate especially towards the base; shrubs rarely less than 25 cm high
Branches conspicuously angled, green; leaves up to 3 cm long; fruit red ..... *V. parvifolium*
Branches not conspicuously angled, never green; largest leaves usually over 3 cm long; fruit bluish or blue black
Flowers opening as leaves begin to develop; leaves glabrous, the nerves usually prominent beneath, the midvein lacking glandular spines; corolla pinkish, urceolate; style exserted ..... *V. ovalifolium*
Flowers opening when leaves about half developed; leaves glabrous or puberulent, the nerves rarely prominent beneath, the midvein with glandular spines; corolla greenish- or bronze-pink, depressed globose; style usually included ..... *V. alaskense*

446. Vaccinium alaskense Howell, Fl. NW. Amer. 412. 1901.
V. oblatum Henry, Fl. South. B.C. 228. 1915.

GRAHAM ISLAND: Queen Charlotte City, *CST20917;* Empire Anchorage, *CS21493;* Kumdis Creek, *CST22117;* Langara Island, *CST22494;* Dawson Inlet, *CST22835A;* 4, 8 and 10 mi S of Juskatla, *S3544*, *CT35477B*, *T17;* Honna River, *CT35403B*, *CT36927*, *CT36977;* Long Inlet, *CT35973;* near Juskatla, June 7, 1952, *Schmidt;* Mamin River, May 30, 1952, *Schmidt* (in part); Port Clements, May 26, 1951, *Cowan* (UBC); NW corner of Graham Island, May 19, 1952, *Beebe* (V); Skidegate, Aug. 2, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: near head of Cumshewa Inlet, *CST21040A;* Bigsby Inlet, *CST22129;* Takakia Lake, *CST23147;* Red Mud Marsh, *CST23199;* Crescent Inlet, *CTS34999;* Koohoo Hill, *CT36251;* Mt. Moresby, *CT36392.*

Only two species of bluish- or blue-black-fruited highbush blueberry occur along the northern British Columbia – Alaska coast. These species *V. alaskense* and *V. ovalifolium* Smith, have been discussed and compared by Camp (1942) in a treatment of *Vaccinium* subgenus *Euvaccinium* and by Hultén (1948, p. 1252, 1253, 1255-1257) in his *Flora of Alaska and Yukon.* As they are closely

Table 22. Comparison of characters of *Vaccinium alaskense* and *V. ovalifolium*

	alaskense	ovalifolium
height	up to about 3.5 m	up to about 3.5 m
twigs	shallow to deeply grooved, glabrous or puberulent	shallow to deeply grooved, glabrous or occasionally puberulent
leaves	elliptic to elliptic-ovate, up to 3.5 cm wide and 7 cm long, entire or weakly glandular-serrulate especially in lower half, glabrous or finely puberulent especially on lower surface, midvein of lower surface with few to many minute glandular spines, lower surface rarely with prominent veins	elliptic to elliptic-ovate, up to 3 cm wide and 5.5 cm long, entire or weakly glandular-serrulate especially in lower half, glabrous on both surfaces, midvein of lower surface lacking minute glandular spines, lower surface usually with prominent veins
pedicels	usually straight, stout, often flaring below ovary	straight or arcuate, slender, not flaring below ovary
flowers	opening when leaves are partially developed, broader than long, greenish- or bronze-pink, depressed globose	opening when leaves are beginning to develop, usually longer than broad, pink, urceolate
styles	exserted	usually included
fruit	usually blue-black and nonglaucous, occasionally reddish tinged	bluish or blue-black, often glaucous

related and at times difficult to distinguish, and as there are a few discrepancies in the key characters used by Camp, Hultén and Hitchcock (*in* Hitchcock *et al.*, 1959), we are including Table 22 to show their distinctive characters.

Vaccinium alaskense and *V. ovalifolium* grow together in many places along the Pacific coast. According to Camp, the former tends to grow in a more mesophytic habitat, but in our experience they grow under similar ecological conditions and this is borne out by their distribution patterns as they occur in British Columbia and Alaska. In comparing the two species Hultén states that *V. alaskense* is a much taller shrub. Although this is usually the case, we have seen shrubs of *V. ovalifolium* about 3.5 m high and Camp has noted that in favorable habitats it reaches a height of about 4 m.

Vaccinium alaskense is normally a more robust shrub with larger and somewhat thinner leaves that are usually minutely pubescent beneath, especially along the veins. The midvein of the abaxial surface has minute glandular spines and the venation beneath is rarely as prominent as in *V. ovalifolium*. In flower there is no problem in distinguishing the two species, but in fruit they are sometimes difficult to separate, although there are usually differences in the fruiting pedicels. It is often difficult to distinguish one species from the other by any one character, but we believe they should be retained as distinct taxa at specific rank. Camp concluded that *V. alaskense* was a polyploid that had arisen from *V. ovalifolium* and *V. parvifolium*, but unfortunately he had little supporting evidence. Only a thorough biosystematic study may reveal a more precise relationship within this complex.

Vaccinium oblatum was described by Henry as having a depressed-globose corolla, blue-black fruit without a bloom, and pedicels 4 to 10 mm long. On the basis of these characters this plant is obviously Howell's *V. alaskense*.

Vaccinium alaskense is widely distributed throughout the Queen Charlotte Islands. It occurs in and along the margins of coniferous woods and is often one of the dominant species in densely shaded forest habitats. It extends to tree line in the Queen Charlotte Ranges.

447. Vaccinium caespitosum Michx., Fl. Bor.-Amer. 1: 234. 1803.

GRAHAM ISLAND: Empire Anchorage, *CS21532;* Newton Pt., *CST-22972;* Shields Bay, *CT23316;* White Creek Muskeg, *CTS34736;* Pure Lake, *CT36096.*

MORESBY ISLAND: Chaatl Narrows, *CST21796;* Bigsby Inlet, *CST-22167;* Echo Harbour, *CST22380;* Takakia Lake, *CST23146, CST23148, CT36312;* Anna Inlet, *CTS34953;* Yatza Mtn., *CT35719;* Mt. Moresby, *CT36424;* Chaatl Village, July 23, 1910, *Spreadborough* (CAN).

Vaccinium caespitosum is a remarkably uniform and wide-ranging species of the north temperate region of North America. In comparison with plants from the interior of British Columbia, those from the Queen Charlottes are less robust; they are often devoid of flowers and fruit; and their leaders are poorly developed and bear few leaves. In addition, the leaf shape is more variable, perhaps because of the depauperate nature of the Queen Charlotte Islands' population. Leaves are often more obovate than in typical *V. caespitosum* from the mainland. In leaf shape and general habit, plants in a collection from Juneau are similar to those of the Queen Charlottes.

Camp (1942, p. 219, 220) described a new species, *V. paludicola*, that is closely allied to *V. caespitosum*, from southeast Alaska and the Prince Rupert area of British Columbia. It is difficult to reach a decision as to how the collections from the Charlottes should be treated, for, as Hultén has pointed out (1948, p. 1255), Camp did not compare his new species to any of the closely related entities. Furthermore, Camp's lengthy discussion on the possible origin of *V. paludicola* lacks any experimental evidence to substantiate his decision. Comparison of our material from the Islands with the description of *V. paludicola* indicates that the Queen Charlotte Islands' population differs in the following ways: the branches are usually terete, rarely weakly angled, the leaves tend to be 2.5 cm or less in length and on the whole smaller than those of *V. paludicola;* and the shrubs are less than 2 dm high. Furthermore, the population of the Queen Charlotte Islands is restricted to subalpine regions, but *V. paludicola* is found in lowland sphagnum bogs. As we are unable to reach a decision regarding *V. paludicola* we are including all collections from the Islands in *V. caespitosum.*

Contrary to the statement by Szczawinski (1962, p. 160) that *V. caespitosum* always occurs in wet meadows or on alpine slopes in mountainous regions, the plant has been collected many times in the dry lowland coniferous woodlands of central British Columbia. This species is apparently absent from the coastal lowlands, but is found in the interior mountain ranges of Vancouver Island and the Queen Charlottes.

448. Vaccinium ovalifolium Smith in Rees, Cycl. 36: No. 2. 1817.
V. chamissonis Bong., Mém. Acad. St. Pétersb. VI. 2: 151. 1832.

GRAHAM ISLAND: Masset, *CST20854;* Tow Hill, *CST21203;* near Haida Pt., *CST21701* (DAOM); Dawson Inlet, *CST22835B;* Blackwater Creek. *T33* (DAOM); Honna River, *CT35403A;* about 8 mi SSW of Juskatla, *CT35477A;* Jalun Lake, *CT35610;* near Kumdis Creek, *CT36892;* Mamin River, May 30, 1952, *Schmidt* (in part); Skidegate, June 1897, *Newcombe* (V).

MORESBY ISLAND: near head of Cumshewa Inlet, *CST21040B*, *CT-35228;* Bigsby Inlet, *CST22130;* Kootenay Inlet, *CT36230;* Sunday Inlet, *CT36622*, *CT36632;* Chaatl Village, July 22, 1910, *Spreadborough* (CAN).

The differences between *V. ovalifolium* and *V. alaskense* Howell are tabulated under the latter species. *Vaccinium ovalifolium* can be distinguished by its pinkish urceolate flowers that appear as the leaves are beginning to develop. The leaves are glabrous, the veins of the lower surface usually prominent, and the midvein beneath lacks minute glandular spines. The pedicels are not enlarged below the ovary and the berries are bluish or blue-black, usually with a conspicuous white bloom.

All records of this species from the Queen Charlotte Islands are from the lowlands, but it probably occurs in subalpine habitats in the Queen Charlotte Ranges because we have found it at high elevations on the mainland and Vancouver Island. Like *V. alaskense*, it is a species that occurs along forest margins and in the most densely shaded coniferous woods. Both species can have either tart or sweet fruit.

449. Vaccinium oxycoccus L., Sp. Pl. 1: 351. 1753.
Oxycoccus quadripetalus Gilib., Fl. Lithuan. 1: 5. 1781.
Vaccinium oxycoccus var. *ovalifolium* Michx., Fl. Bor.-Amer. 1: 228. 1803; *O. ovalifolius* (Michx.) Porsild, Can. Field-Nat. 52: 116. 1938, as to western North American plants.
V. oxycoccus var. *intermedium* A. Gray, Syn. Fl. Amer. ed. 2. 2: 396. 1886; *O. intermedius* (A. Gray) Rydb., Fl. Rocky Mts. 646. 1917.
O. oxycoccus MacM., Bull. Torrey Club 19: 15. 1892.
O. palustris sensu Abrams, Ill. Fl. Pacif. States 3: 329. 1951.

GRAHAM ISLAND: about 3 mi NW of Tlell, *CST20944* (DAOM), *CST23478*, *CTS34605;* near Tow Hill, *CST21159;* between Tow Hill and Rose Spit, *CST21213;* about 8 mi SE of Port Clements, *CST21357;* Langara Island, *CST22493;* Empire Anchorage, *CS21535* (DAOM); Newton Pt., *CST22945;* 9 mi S of Juskatla, *T69;* Jalun Lake, *CT35685;* NW of Queen Charlotte City, July 10, 1952, *Schmidt*, MacIntosh Meadows, Aug. 23, 1961, *Foster & Bigg* (UBC); Yakoun Lake, Aug. 1895, *Newcombe* (V); Skidegate, Aug. 29, 1910, *Spreadborough* (CAN).

MORESBY ISLAND: Chaatl Narrows, *CST21756;* White Swan Bog, *CST21935;* Bigsby Inlet, *CST22173;* Upper Victoria Lake, *CT35734;* Kootenay Inlet, *CT36180.*

Vaccinium oxycoccus (*s.l.*) is a widespread circumboreal species that is frequently segregated from the rest of *Vaccinium* as a distinct genus *Oxycoccus* on the basis of floral morphology. There is little unanimity of opinion as to the generic position of the *oxycoccus* complex and for the time being we prefer to retain this group in the genus *Vaccinium*. Camp (1944) in a recent conspectus of the genus *Oxycoccus* for North America recognized three species: *O. macrocarpus* (Ait.) Pers., *O. microcaprus* Turcz., and *O. quadripetalus* Gilib. The first two species are diploid ($2n=24$) whereas the latter entity is tetraploid ($2n=48$). However, it should be pointed out that these levels of ploidy were based on only a few (possibly no more than five) chromosome determinations (Darrow *et al.*, 1944, p. 503). Within *O. quadripetalus*, Camp proposed that two groups be distinguished, "macrocarpoid" and "microcarpoid." The differences between them are based essentially on characters of the inflorescence, but these two groups can be further segregated by other morphological characters such as leaf size and pubescence. Following examination of our Canadian and Alaskan material we are in agreement with Camp's general taxonomy and recognize three entities: *V. macrocarpon* Ait. (= *O. macrocarpus*), *V. microcarpum* (Turcz.) Hook. (= *O. microcarpus*), and *V. oxycoccus* (= *O. quadripetalus*). The recognition of the two taxa, *V. microcarpum* and *V. oxycoccus*, remains in doubt, and the distinction between them is difficult unless chromosome counts are available. To date there has been no extensive cytological survey of North American material and the distinction can only be considered relevant when such a survey has been completed. The existence of complex intermediate populations between these two taxa indicates that it might be advisable to recognize a single species, *V. oxycoccus*, with two subspecies. We are reluctant, however, to proceed along this line at this time as we do not have sufficient experimental evidence to support this taxonomic proposal. Thus we are recognizing *V. microcarpum* and *V. oxycoccus* as weak taxa on the basis of the following morphological characters:

V. microcarpum: largest leaves usually 6 mm long or less (rarely up to 7 mm), usually 2 mm or less in width (rarely up to 3 mm), strongly involute, ovate-triangular; pedicels always glabrous above the bracts

V. oxycoccus: largest leaves usually 7 mm long or more (rarely as short as 6 mm), never less than 3 mm wide, less strongly involute than those of *V. microcarpum*, elliptic or elliptic-ovate; pedicels always pubescent above the bracts.

Although the Queen Charlotte Island population is composed mainly of plants that can be readily identified as *V. oxycoccus*, a few individuals tend to have some characteristics of *V. microcarpum*. Although some variation is present, we are recognizing all plants as *V. oxycoccus*. This species is a common and conspicuous element of the extensive sphagnum bogs found on the Islands. Although the leaves are generally shorter, narrower and more tightly involute than those on plants from Vancouver Island, and although there is also a tendency for the pedicels to be less pubescent, both these coastal populations clearly form part of the distribution of *V. oxycoccus* in the Pacific Northwest. Abundantly fruiting colonies were noted in August.

450. Vaccinium parvifolium Smith in Rees, Cycl. 36: No. 3. 1817.

GRAHAM ISLAND: Masset, *CST20852;* Tlell, *CST20888;* Queen Charlotte City, *CST20910;* Tow Hill, *CST21204;* 3½ and 8 mi S of Masset, *CST21274* (DAOM), *CST22813;* near Skidegate Village, *CST21420* (DAOM); Empire Anchorage, *CS21444;* Kumdis Creek, *CST22113* (DAOM); west of Queen Charlotte City, *CST22460*, *CST23033* (DAOM); Langara Island, *CST22547;* June 11, 1952, *Guiget* (V); Dawson Inlet, *CST22840;* 10 mi SSE of Juskatla, *T16;* mouth of Kliki Creek, *CT36823;* near Juskatla, June 7, 1952, *Schmidt;* Skidegate, May and June 1901, *Newcombe* (V), July 29, 1910, *Spreadborough* (CAN); Dawson Harbour, June 26, 1897, *Newcombe* (V).

MORESBY ISLAND: head of Cumshewa Inlet, *CST20963;* Bigsby Inlet, *CST22131;* Echo Harbour, *CST22315;* Red Mud Marsh, *CST23198;* Mt. de la Touche, *CT23570;* Anna Inlet, *CTS34938;* Upper Victoria Lake, *CT35808;* Kootenay Inlet, *CT36218;* Sunday Inlet, *CT36634;* Rose Inlet, *CT36999;* Little Goose Bay, Sept. 10, 1951, *Pillsbury* (UBC).

The red-fruited *V. parvifolium* (red huckleberry) is widely distributed along the Pacific coast from the northern part of the Alaska panhandle south to Fresno County, California. There are isolated populations in southern interior British Columbia around Kootenay and Upper Arrow lakes and in the Revelstoke area.

Vaccinium parvifolium occurs throughout the Queen Charlotte Islands, and though essentially a lowland species, it is found on mountain slopes to at least 1,000 ft. It is one of the dominant shrubs in the coniferous forests, where it thrives under densely shaded conditions that few other higher plants can tolerate. It often forms dense thickets up to 4 m high, especially along the margins of clearings and in logged-over areas. The leaves of this species are entire or essentially so, but in the juvenile stage they are usually serrulate. The somewhat tart berries are picked in large quantities by the local inhabitants.

451. Vaccinium scoparium Leiberg, Mazama 1: 196. 1897.

MORESBY ISLAND: Little Goose Bay, Louise Island, 1951, *Pillsbury* (UBC).

Vaccinium scoparium in the Queen Charlotte Islands is represented by a single collection made in 1951 by Prof. R. Pillsbury of the University of British Columbia from a spruce drift-log at Little Goose Bay on the south shore of Louise Island. Mueller-Dombois, who studied the genus *Vaccinium* in British Columbia, and whose unpublished manuscript is at the Provincial Museum in Victoria, appended the following notes to the sheet: "This specimen combines the features of three species, *V. scoparium*, *V. myrtillus* L. (*V. oreophilus*) and *V paludicola* Camp, but it seems to be closest to *V. scoparium*. Uncharacteristic for *V. scoparium* are the puberulent grooves [of the branches] and the absence of

typical broomy habit." There are two plants (10 and 20 cm high) and one fragment on the sheet, and in our view they could be referred to no other species but *V. scoparium*. This species has angular branches that occasionally have puberulent grooves, and although the plants lack the usual broomlike appearance this character is of no great significance. *Vaccinium myrtillus* does not occur in western British Columbia, but is restricted to the Selkirk, Purcell and Rocky mountains in the southeastern part of the province. We have seen no material of Camp's (1942, p. 219) *V. paludicola* in the many collections of the *V. caespitosum* complex that we have examined from Alaska and British Columbia. The presence of an endemic *Vaccinium* along the Alaska – British Columbia coast from Prince Rupert to Prince William Sound is most unlikely on the basis of our present knowledge of coastal phytogeography.

Although this species is not native to the Queen Charlotte Islands its presence on a drift-log is most significant as it indicates that at least some species could have become established on the Islands by rafting from the mainland.

452. Vaccinium uliginosum L., Sp. Pl. 1: 350. 1753.

GRAHAM ISLAND: near Tow Hill, *CST21175;* 7½ and 15 mi S of Masset, *CST21260A*, *CT35582;* Empire Anchorage, *CS21482;* Tan Mtn., *CST21627;* Langara Island, *CST22495;* between Ells and Mercer pts., *CST-22902;* Newton Pt., *CST22967;* Shields Bay, *CT23316A*, *CT23359;* White Creek Muskeg, *CTS34735;* N of Queen Charlotte City, July 5, 1952, *Schmidt;* Masset, July 1901, *Newcombe* (V); 5 mi W of Tlell, May 27, 1951, *Cowan* (UBC); Tlell, June 2, 1951, *Cowan* (UBC).

MORESBY ISLAND: White Swan Bog, *CST21945;* Newcombe Peak, *CST22025;* Bigsby Inlet, *CST22147*, *CTS34907;* Echo Harbour, *CST22340;* Takakia Lake, *CST23078;* Mosquito Mtn., *CT23731*, July 13, 1961, *Foster & Bigg* (UBC); Anna Inlet, *CTS34962;* Yatza Mtn., *CT35725;* Kootenay Inlet, *CT36171;* Chaatl Village, July 26, 1910, *Spreadborough* (CAN).

Vaccinium uliginosum is a polymorphic circumpolar species in which a number of infraspecific taxa have been described. The North American population has been recognized by some authors as a distinct entity, *V. uliginosum* var. *alpinum* Bigel. Hultén (1948, p. 1260, 1261) stated that the typical phase from Eurasia cannot realistically be separated from var. *alpinum*. The leaf and fruit characters used for separation are so variable that similar plants can be found in both populations. For these reasons he recognizes all Alaskan material as a single taxon, *V. uliginosum*. A closely related species, *V. occidentale* A. Gray, has been reported to occur in southern British Columbia. This latter species apparently differs from *V. uliginosum* in the shape and venation of leaves and berry size. We have carefully examined our extensive collections of *V. uliginosum* from British Columbia and find that the distinguishing characters reported for *V. occidentale* may be found in populations of *V. uliginosum* occurring far to the north of the presumed distribution of *V. occidentale*. The variation in leaf size and venation is often correlated with the age of the plant and its habitat.

Collections made on boggy and rocky slopes in subalpine regions frequently possess acute- or obtuse-tipped leaves 0.6 to 2.3 cm long and having a width-to-length ratio of 0.2 to 0.68. Measurements taken on one collection from the Queen Charlotte Islands (*CST22025*) shows the following variation: leaf width, 2.5 to 11.0 mm; leaf length 5.5 to 19.5 mm; leaf width-to-length ratio, 0.27 to 0.67. The variation is associated with the degree of shrubbiness and length of the leaders in a particular season. If the leaders are short the leaves tend to be small and leaf width-to-length ratio high; if the leaders are well developed the leaves are larger and width-to-length ratio usually smaller. The smaller leaves may have rather inconspicuous venation whereas the larger ones have prominent veins. These differences have been used in segregating the two species, *V. uliginosum* and *V. occidentale*, as well as the infraspecific taxa in the former species. The size of berries is also of dubious diagnostic value. The evaluation of these two species and other segregates of *V. uliginosum* requires a detailed study that is beyond the scope of this *Flora*.

Vaccinium uliginosum on the Queen Charlotte Islands is a dominant element of the extensive sphagnum bog–shrub association and the krumholz zone in subalpine regions. During both our summer surveys fruit production was particularly good in the lowland sphagnum bogs, whereas many plants in subalpine habitats failed to produce flowers.

453. Vaccinium vitis-idaea L. ssp. **minus** (Lodd.) Hult., Fl. Aleut. Is. 268. 1937.

GRAHAM ISLAND: between Tow Hill and Rose Spit, *CST21227;* Empire Anchorage, *CS21473;* 8 and 5½ mi SE of Port Clements, *CST22086*, *CTS34591;* Langara Island, *CST22582*, May 21, 1952, *Beebe* (V); near Tow Hill, *CST22710;* Newton Pt., *CST22977;* 3 mi NW of Tlell, *CST23488;* Tlell, July 10, 1952, *Ziller*, May 27, 1951, *Cowan* (UBC); near Port Clements, June 27, 1952, *Schmidt;* Yakoun River, June 10, 1952, *Schmidt;* White Creek Muskeg, *CTS34744;* 3 mi E of Juskatla, *CTS35052;* Dawson Inlet, CTS35096; about 15 mi S of Masset, *CT35567;* Jalun Lake, *CT35682;* Masset, 1901, *Newcombe* (V).

MORESBY ISLAND: Chaatl Narrows, *CST21797;* Upper Victoria Lake, *CT35732;* Kootenay Inlet, *CT36185*.

A thorough discussion of the distribution and distinguishing characteristics of the North American and eastern Siberian ssp. *minus* and its relationship to the typical subspecies of Europe and Asia is given by Hultén (1949*b*, p. 394–398). All our material from the Islands can be readily identified as ssp. *minus* on the basis of flower and leaf characters.

Vaccinium vitis-idaea is a common plant of well-developed bogs on Graham Island. It reaches its best development on the drier sphagnum hummocks found in and along the margins of the scattered islands of spruce and pine. A few collections of this species were made on subalpine slopes of the Queen Charlotte Ranges.

Primulaceae

Plants scapose; corolla lobes sharply reflexed..... *Dodecatheon*
Plants not scapose; corolla lobes not reflexed
  Plants caespitose; flowers in terminal umbels..... *Douglasia*
  Plants not caespitose; flowers never in umbels
    Flowers white or pink
      Flowers pedicellate; corolla present; leaves thin, lanceolate-ovate to obovate; bog plants..... *Trientalis*
      Flowers sessile; corolla absent; leaves fleshy, narrowly lanceolate; maritime plants..... *Glaux*
    Flowers yellow..... *Lysimachia*

DODECATHEON

Plants glandular-pubescent; stigmas enlarged; connective prominently rugose; filaments purplish, inconspicuous, less than 1 mm long..... *D. jeffreyi*
Plants glabrous; stigmas not enlarged; connective usually smooth; filaments yellow, prominent, usually more than 2 mm long..... *D. pulchellum*

454. Dodecatheon jeffreyi Van Houtte, Fl. Serres 16: 99. *pl.* 1662. 1865.
D. viviparum Greene, Erythea 3: 38. 1895.
D. tetrandrum Suksd. ex Greene, *op. cit.* 40.

GRAHAM ISLAND: 4½ mi NW of Tlell, *CST20952;* near Tow Hill, *CST21166*, *CST22714* (DAOM); between Tow Hill and Rose Spit, *CST21211*, *CST22738* (DAOM); Yakan Pt., *CST21318;* Empire Anchorage, *CS21478;* Tan Mtn., *CST21607;* 7 mi SE of Port Clements, *CST22079* (DAOM); Langara Island, *CST22585;* between Ells and Mercer pts., *CST22899;* Newton Pt., *CST22947;* Shields Bay, *CT23297*, *CT23357;* 9 mi SSE of Juskatla, *T68;* White Creek Muskeg, *CTS34742;* Jalun Lake, *CT35624;* Marie Lake, June 10, 1952, *Schmidt* (DAO, UBC); Tlell River, *Green* (UBC); Mt. Needham, June 18, 1961, *Foster & Bigg* (UBC).

MORESBY ISLAND: Chaatl Narrows, *CST21771;* Newcombe Peak, *CST21997;* Bigsby Inlet, *CST22144;* Takakia Lake, *CST23118*, *Foster & Joslin 57* (UBC); Red Mud Marsh, *CST23191;* Mt. de la Touche, *CT23587;* Mosquito Mtn., *CT23733*, Anna Inlet, *CTS34935*, *CTS34936;* Mt. Moresby, *CT35323;* Upper Victoria Lake, *CT35736;* Mt. Russ, *CT36160;* Skidegate Lake, *Foster & Joslin 12* (UBC); Tasu Sound, June 26, 1961, *Foster & Bigg* (UBC); Security Cove, June 19, 1959, *Brown* (V).

Plants of this species from the Queen Charlotte Islands belong to the northern ssp. *jeffreyi* and constitute a uniform, widespread, and conspicuous

element of boggy habitats throughout the Islands. Subspecies *jeffreyi* is found in low-lying sphagnum bogs in eastern Graham and Moresby islands. It also occurs along creek banks in sedge meadows, in mossy-rocky runnels, and around pool margins on open-forested slopes from sea level to alpine summits in the Queen Charlotte Ranges.

455. Dodecatheon pulchellum (Raf.) Merrill, J. Arnold Arb. 29: 212. 1948.

D. integrifolium sensu Hook., Bot. Mag. 64. *pl.* 3622. 1837, *non* Michx.
Exinia pulchella Raf., Aut. Bot. 185. 1840.
D. pauciflorum (Durand) Greene, Pittonia 2: 72. 1890.
D. radicatum Greene, Erythea 3: 37. 1895.
D. frigidum sensu Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 66. 1921.
D. watsonii Tidestr., Proc. Biol. Soc. Wash. 36: 183. 1923; *D. radicatum* ssp. *watsonii* (Tidestr.) H. J. Thompson, Contr. Dudley Herb. 4: 147. 1953; *D. pauciflorum* var. *watsonii* (Tidestr.) C. L. Hitchc., Vasc. Pl. Pacif. NW. 4: 45. 1959.
D. superbum Pennell & Stair, Bartonia 24: 20. 1947.
D. macrocarpon var. *alaskanum* Hult., Fl. Alaska & Yukon 8: 1289. 1948; *D. pauciflorum* var. *alaskanum* (Hult.) C. L. Hitchc., *l.c.*
D. radicatum ssp. *macrocarpon sensu* Beamish, Bull. Torrey Club 82: 363. 1955.

GRAHAM ISLAND: Lepas Bay, *CST22591.*

MORESBY ISLAND: South Low Island, *CTS34831;* Limestone Island, June 9, 1913, *Newcombe* (UBC, V), May 27, 1923, *Newcombe* (V); Tasu, May 1901, *Newcombe* (V); Skedans, May 10, 1901, *Newcombe* (V).

The genus *Dodecatheon* has had a long and confused taxonomic history, as is evident from the multitude of synonyms and misapplied names that are included in Thompson's (1953) biosystematic study. Our understanding of the genus has been hampered by the limited amount of material available, but extensive surveys by the Plant Research Institute in western Canada over the past ten years have provided a clearer picture of the relationships of *Dodecatheon* within this region. In order to discuss the species of this genus for the flora of the Queen Charlotte Islands, we have carefully examined many collections in an attempt to clarify the taxonomy of the genus in Canada. We recognize a total of eight taxa for Canada, and two of these, *D. pulchellum* ssp. *pulchellum* and *D. jeffreyi* Van Houtte ssp. *jeffreyi*, occur in the Queen Charlotte Islands.

The widespread *D. pulchellum* is represented by two subspecies in Canada: (1) ssp. *cusickii* (Greene) Calder & Taylor, which occurs in the dry interior valleys and occasionally in xerophytic alpine habitats in the south-central portion of British Columbia; and (2) ssp. *pulchellum*, which is comprised of three disjunct populations: one along the British Columbia – Alaska coast, another extending from the southern part of the Rocky Mountain Trench in British Columbia east to Saskatchewan, and finally an isolated population in the central part of the Yukon. Most authors consider that plants from the Pacific coast constitute a distinct species or at least a subspecies of *D. pulchellum* However, we fully agree with Thompson (pers. comm.) that it is impossible to distinguish between specimens from the coast and the interior.

We would also include in ssp. *pulchellum* the depauperate and usually alpine ssp. *watsonii* (Tidestr.) Thompson, which we believe is merely an ecological phenotype. A collection made at sea level on Trial Island off Victoria would certainly be considered as ssp. *watsonii* by some taxonomists. This treeless island is subject to constant sea winds and many of the plants found here are few-flowered and depauperate. In open, oak–madrona forest on the nearby mainland, however, typical *D. pulchellum* occurs. To the north, in subalpine habitats near the summit of Mount Arrowsmith, we again find plants that could be considered as ssp. *watsonii;* however, we are unable to distinguish them from those that occur at sea level on Trial Island. It is interesting to note that Thompson (*op. cit.*, p. 116) speaks of ssp. *watsonii* as an alpine form that can be distinguished from ssp. *pulchellum* by the size of the leaves and scapes and the degree of tapering of the leaf petioles, two extremely variable characters in *D. pulchellum.*

Although we can find no diagnostic morphological characters to separate the coastal and inland populations of ssp. *pulchellum*, Beamish (1955, p. 358) reports differences in ploidy level between the two populations. The differences are based on six counts from widely separated areas, three from the coast and three from the interior. Plants from along the coast were both tetraploid (two counts) and hexaploid (one count), whereas those from the interior were all diploid. More chromosome counts are needed to document the extent of these cytological races.

Dodecatheon pulchellum ssp. *pulchellum* is rare on the Queen Charlotte Islands. It is only known from five stations, where it is restricted to cliffs and rock stacks at the shoreline.

Douglasia

456. Douglasia laevigata A. Gray ssp. **ciliolata** (Constance) Calder & Taylor, Can. J. Bot. 43: 1398. 1965.

D. laevigata var. *ciliolata* Constance, Amer. Midl. Nat. 19: 254. 1938.

MORESBY ISLAND: Mt. Moresby, *CT36385.*

In a revision of the genus *Douglasia*, Constance (1938) recognized two geographic variants for *D. laevigata.* The typical phase from the Columbia Gorge region of Washington and Oregon is characterized by its less robust habit, narrow, glabrous or inconspicuously ciliolate leaves, and small flowers on long slender pedicels. The widely distributed ssp. *ciliolata*, which extends north to the Queen Charlotte Islands, is a more robust plant in all its parts. It has broader, conspicuously ciliolate leaves and larger flowers on shorter, stouter pedicels. The material from the Charlottes consists of a few sterile rosettes; however, these plants clearly belong to the more northern ssp. *ciliolata. Douglasia laevigata*, an extremely rare alpine species in British Columbia, was previously known from only two collections, both from the mountains of central Vancouver Island (Golden Hinde, *Calder & McKay 32530*, July 1937, *Stewart,* V). There is also a sight record by E. J. Greig (pers. comm.): mountain slopes between Volcano Lake and Elk River valley in Strathcona Provincial Park.

The plants from the Charlottes were found in a gravel runnel at about 1,000 ft on the steep north-facing slope of Mount Moresby. This mountain is part of a chain that includes Mosquito Mountain and is the only region on the Islands where certain alpine species were collected, for example, *Thalictrum alpinum* L., *Ranunculus pygmaeus* Wahlenb., *Cardamine bellidifolia* L., *Oxytropis campestris* (L.) DC., *Arabis lyrata* ssp. *kamchatica* (Fisch.) Hult., and *Arenaria stricta* ssp. *macra* (Nels. & Macbr.) Maguire.

Glaux

457. Glaux maritima L. ssp. **obtusifolia** (Fernald) Boivin, Bull. Soc. Bot. Belg. 88: 10. 1955.
G. maritima ssp. *obtusifolia* var. *macrophylla* Boivin, *l.c.*

GRAHAM ISLAND: Delkatla Inlet, *CST21294;* Tlell, *CST21372*, July 25, 1925, *W. A. Newcombe* (V); Yakoun River Delta, *CST21557;* McClinton Bay, *CST21648;* west of Queen Charlotte City, *CST22483;* Juskatla, *S3518;* Dawson Inlet, *CTS35143;* Naden Harbour, *CTS36865;* Skidegate, June and July 1897, *Newcombe* (V).

MORESBY ISLAND: Copper Bay, *CST21879;* head of Cumshewa Inlet, *CST21990, CT35229;* Anna Inlet, *CTS34923;* Tasu, June 1901, *Newcombe* (V).

The Queen Charlotte Island material of *Glaux* is characterized by large (up to 8 mm wide) blunt-tipped leaves. Plants are upright and have occasional lateral branches. No prostrate spreading specimens were observed. The population on the Islands is similar to that found along the west coast of British Columbia and Alaska and it can be readily distinguished from the narrow-leaved (up to 2.5 mm) and profusely branched interior population, which belongs to the typical phase, ssp. *maritima*. The two subspecies may be separated on the basis of leaf width-to-length ratio. *Glaux maritima* L. ssp. *maritima* has usually acute-tipped leaves with a length-to-width ratio of more than 3.25 whereas *G. maritima* ssp. *obtusifolia* possesses blunt-tipped leaves with a length-to-width ratio of less than 3.0 and is always coastal in its distribution.

We are following essentially the taxonomy proposed by Fernald (1902), in which he designated two varieties of *G. maritima*. Boivin (1955) in a later taxonomic paper, raised the two varieties proposed by Fernald to subspecific rank and in addition described two varieties for each of the subspecies, *G. maritima* ssp. *maritima* and *G. maritima* ssp. *obtusifolia*. We have found it difficult to evaluate the varieties proposed by Boivin because similar morphological structures are not always compared in his varietal descriptions within one subspecies and the range of variation is much greater than he indicated. Boivin's description of the inland race, *G. maritima* ssp. *maritima* var. *angustifolia* Boivin is particularly perplexing as examination of the type reveals that leaf width ranges up to 3.5 mm and thus falls outside the range of 1.5 to 2.0 mm given in the description for this variety. As a result of our analysis of the European and American material from a morphological and distributional point of view, we

are recognizing only the two subspecies, *maritima* and *obtusifolia*, and not the doubtful varieties described by Boivin.

The two subspecies are both distinct in their morphology and in their distribution in British Columbia. The interior ssp. *maritima* is found only in the Chilcotin district and Rocky Mountain Trench, whereas ssp. *obtusifolia* is restricted to the coast. Hitchcock (*in* Hitchcock *et al.*, 1959, p. 49) believes the two taxa have little taxonomic status because they occur sympatrically and many intermediates are present in the area covered by his *Flora*. Certainly this relationship is not true for southern British Columbia as only ssp. *obtusifolia* is found on Vancouver Island and the adjacent mainland. Between the localities where the coastal subspecies and the dry-land interior subspecies occur there is a 150-mile stretch, which includes the Coast Mountains where neither are found.

The isolated Yukon population, although slightly atypical, is considered part of ssp. *maritima*. The diversity can be expected because the Yukon population has in all probability been derived from the prairie entity but has been isolated from the main population since the end of the Hypsithermal.

Glaux maritima ssp. *obtusifolia* is restricted to coastal habitats in the Islands and occurs in saline marshes and meadows along protected bays or on river deltas. The degree and amount of branching is related to the presence or absence of other plants in the habitat. For example, plants found growing on relatively open, mucky river deltas are usually more branched than those found growing in dense saline sedge meadows. However, ssp. *obtusifolia* is never as conspicuously branched or as prostrate as the typical subspecies.

Lysimachia

458. *Lysimachia punctata L., Sp. Pl. 1: 147. 1753.

GRAHAM ISLAND: Skidegate Village, *CT36954*.

This attractive garden plant was collected as an escape at the outskirts of Skidegate Village. It was also noted as an aggressive escape at Queen Charlotte City. Ray (1956, p. 60), in a monograph of the genus for the New World, indicates that it is confined to eastern United States and Canada.

These records apparently constitute the first report for this species in western North America.

Trientalis

459. Trientalis europaea L., Sp. Pl. 1: 344. 1753.

T. aleutica Tatewaki, J. Fac. Agr. Hokkaido Imp. Univ. 36: 74. 1934.

T. arctica Fisch. ex Hook., Fl. Bor.-Amer. 2: 121. 1838; *T. europaea* var. *arctica* (Fisch.) Lehm., Fl. Ross. 3: 25. 1847; *T. europaea* ssp. *arctica* (Fisch.) Hult., Fl. Kamtch. 4: 56. 1930.

GRAHAM ISLAND: 3½ mi NW of Tlell, *CST20945;* between 6 and 8 mi SE of Port Clements, *CST22081* (DAOM), *CST21354*, *CTS34616;* near mouth of Sangan River, *CST21138;* near Tow Hill, *CST21174*, *CST22702;* 7½ mi S of

Masset, *CST21265;* Tlell, *CST21376*, May 27, 1951, *Cowan* (UBC); Empire Anchorage, *CS21470*, *CS21527* (DAOM); Tan Mtn., *CST21587;* Langara Island, *CST22518;* Shields Bay, *CT23360;* 9 and 10 mi SSE of Juskatla, *T67*, *T12;* White Creek Muskeg, *CT34737;* Juskatla, June 17, 1952, *Schmidt;* Marie Lake, June 10, 1952, *Schmidt;* N of Queen Charlotte City, July 10, 1952, *Schmidt.*

MORESBY ISLAND: near Skidegate Lake Bridge, *CST21009;* White Swan Bog, *CST21032*, *CT35302;* Bigsby Inlet, *CST22152;* Anna Inlet, *CTS-34930;* E end of Skidegate Lake, *CT35267;* Upper Victoria Lake, *CT35795;* Takakia Lake, *Foster & Joslin 58* (UBC); Mt. Moresby, July 13, 1961, *Foster & Bigg* (UBC); Tasu, 1901, *Newcombe* (V).

The taxonomic position of the North American counterpart of the Eurasian *T. europaea* has never been carefully determined. Hultén (1930, p. 59) discusses the reasons for his establishment of *T. europaea* ssp. *arctica*, but indicates that the diagnostic characters used in distinguishing the typical subspecies from the northern Pacific and eastern Asiatic ssp. *arctica* are tenuous. In his *Flora of Alaska and Yukon* (1948, p. 1293) he states, "It seems hopeless to try to find a definite line of demarcation between these races." We have compared North American material with European and fully concur with his earlier statement (1930, p. 59), "As *T. europaea* is a very variable plant, the above-mentioned differences [those of *T. europaea* ssp. *arctica*] may lie within the latitude of variation in the European plant . . .," and further, "As it has not been possible so far to claim for it [ssp. *arctica*] any distinct characteristics, I think it best to regard the plant as a geographical race of *T. europaea.*" As we have not been able to consistently distinguish the Pacific northwest material from the European we are referring our Pacific coast collections to *T. europaea.* Clearly this is a genus that is in need of a good monograph in which modern taxonomic procedures are followed.

The material from the Queen Charlotte Islands is mainly restricted to lowland bogs and adjacent coniferous woods in the eastern sections of the Islands. Plants growing in the extensive bogs are small and possess numerous cauline leaves that are similar in shape and size to those of the terminal whorl. Flowers are white to pink.

Gentianaceae

Plants annual; flowers mauve or purplish white
- Largest stem leaves more than 1 cm long; flowers mauve; coastal meadows ..... *Gentianella*
- Largest stem leaves less than 1 cm long; flowers purplish white; bogs ..... *Gentiana*

Plants perennial; flowers blue
- Basal leaves petiolate, much larger than upper stem leaves; flowers pedicellate, corolla rotate, petals purple-flecked and -veined ..... *Swertia*

Basal leaves sessile, much smaller than upper stem leaves; flowers sessile, corolla funnelform, petals not purple-flecked or -veined..... *Gentiana*

GENTIANA

Plants annual; flowers pedicellate, purplish white..... *G. douglasiana*
Plants perennial; flowers sessile, blue..... *G. platypetala*

460. Gentiana douglasiana Bong., Mém. Acad. St. Pétersb. VI. 2: 156. *pl.* 6. 1833.

GRAHAM ISLAND: 3½ mi NW of Tlell, *CST20946*, *CST23469* (DAOM), *CTS34612;* 7½ mi S of Masset, *CST21264;* Empire Anchorage, *CS21469;* 8 mi SE of Port Clements, *CST22089;* Langara Island, *CST22502;* near Tow Hill, *CST22711;* between Ells and Mercer pts., *CST22876;* Newton Pt., *CST22959A & B;* Shields Bay, *CT23278;* Tan Mtn., *CST23846;* White Creek Muskeg, *CTS34734;* Yakoun Lake, *CT36754*, Aug. 1895, *Newcombe* (CAN, V); NW of Queen Charlotte City, July 10, 1952, *Schmidt* (DAO, UBC); Masset, Sept. 12, 1912, *Green* (UBC); Tlell River, Sept. 16, 1914, *Green* (UBC); Tlell, May 27 and June 2, 1951, *Cowan* (UBC); MacIntosh Meadows, Aug. 23 and 28, 1961, *Foster & Bigg* (UBC).

MORESBY ISLAND: Bigsby Inlet, *CST22174;* Echo Harbour, *CST22374;* Takakia Lake, *CST23079;* Anna Inlet, *CTS34972;* Upper Victoria Lake, *CT35721*, *CT35804;* Kootenay Inlet, *CT36184;* Sunday Inlet, *CT36633;* Mt. Moresby, Aug. 1961, *Foster & Bigg* (UBC).

Gentiana douglasiana is common in the lowland bogs throughout the Queen Charlotte Islands and on open boggy slopes from sea level to mountain summits. The stems, leaves and flowers are normally purple-pigmented, but plants often lack this pigmentation and are essentially yellowish green. In 1957 it was first noted in flower on May 27 in the bogs between Port Clements and Tlell, and it was still flowering in subalpine habitats on Moresby Island in late August.

461. Gentiana platypetala Griseb. in Hook., Fl. Bor.-Amer. 2: 58. 1838. **Figure 168.**

GRAHAM ISLAND: between Ells and Mercer pts., *CST22867;* Newton Pt., *CST22944;* Shields Bay, *CT23315;* Yakoun Lake, July-Aug. 1895, *Newcombe* (CAN, V); Dawson Inlet, Aug. 1961, *Foster & Bigg* (UBC).

MORESBY ISLAND: Echo Harbour, *CST22350* (DAOM); Takakia Lake, *CST23092;* Mt. de la Touche, *CT23572;* Mosquito Mtn., *CT23689;* Upper Victoria Lake, *CT35811;* Kootenay Inlet, *CT36157.*

The only species with which *G. platypetala* might be confused is *G. sceptrum* Griseb. which is found in lowland areas on the adjacent mainland coast, where it is close to its northern limit in the Skeena River drainage. Although the two

species are closely related, they may be readily distinguished both morphologically and by their individual ecological requirements. The differences between them are as follows:

platypetala	**sceptrum**
alpine or subalpine; rocky exposures and grassy slopes	lowland or rarely subalpine; bogs and wet meadows
leaves ovate to elliptic, usually strongly divaricate	leaves usually lanceolate to linear-lanceolate, usually ascending
calyces spathiform	calyces tubular
corolla lobes mucronate	corolla lobes rounded to subacute

This species is restricted to a narrow belt along the Alaska – British Columbia coast from Kodiak Island to the Charlottes. A collection from the Bella Coola region opposite the southern tip of Moresby Island (Caribou Mts., about 7,000 ft, *Laing 619*, CAN) is the only record from mainland British Columbia.

Gentiana platypetala is common throughout the Queen Charlotte Ranges in subalpine and alpine habitats, and often extends to sea level on the exposed outer coast, where it is found with a number of other alpine species. It prefers talus slopes or weathered outcrops, but commonly occurs in subalpine meadows. Plants range from 5 to 35 cm in height depending upon the degree of exposure. It is a beautiful species, which flowers from mid-July through to early September.

A Green collection in the herbarium of the University of British Columbia labeled Sept. 16, 1914, Tlell River, is not cited because the locality is almost certainly in error.

Figure 168. *Gentiana platypetala* Griseb. in Hook. in a montane region of Queen Charlotte Ranges. (Photograph courtesy Dr. A. Sutherland Brown.)



Gentianella

462. Gentianella amarella L. ssp. **acuta** (Michx.) J. M. Gillett, Ann. Missouri Bot. Gard. 44: 253. 1957.
Gentiana acuta Michx., Fl. Bor.-Amer. 1: 177. 1803.

GRAHAM ISLAND: Masset Spit, *CST22640*, *CST36833;* 2 mi S of Tlell, *CST23243;* Tlell, *Pillsbury 391* (DAO, UBC); Masset, Sept. 8, 1902, *Newcombe* (V).

This species is common behind the beach ridges at the base of the spit near the mouth of Masset Harbour and in a seaside hayfield south of Tlell. It was not noted elswhere during the 1957 and 1964 surveys and is probably restricted to eastern Graham Island.

In the National Museum at Ottawa there is a Dawson collection from the Queen Charlotte Islands labeled July, 1878, but lacking information as to exact locality.

Swertia

463. Swertia perennis L., Sp. Pl. 1: 226. 1753.

MORESBY ISLAND: Takakia Lake, *CST23065*, *CT36265;* Mosquito Mtn., *CT23694*, *CT23715*, *CT36468;* Mt. Russ *CT36156;* Mt. Moresby, *CT36441.*

Swertia perennis is restricted to subalpine and alpine grassy slopes on the highest mountains in the Queen Charlotte Ranges. It was locally common in the col above our camp site at Takakia Lake, where it was growing in association with *Viola langsdorffii* (Regel) Fisch., *Senecio newcombei* Greene, and *Habenaria chorisiana* Cham. Dwarf plants, 6 to 16 cm high, were collected in full bloom in August 1957 around a tarn at 2,800 ft on Mosquito Mountain at the west end of Mosquito Lake. Taller plants were found on open slopes at lower elevations to at least 500 ft below tree line.

Swertia perennis is common in bogs and meadows at sea level further north in the coastal belt bordering the Gulf of Alaska, but towards the southern limits of its range is restricted to high elevations in the mountains. The only other records for the province, excluding those from the Charlottes, are from the extreme northwest section along the Haines Road. A Green collection labeled Tlell River, July and Sept. 16, 1914 (UBC), is probably incorrect as to locality because the Tlell River drains an area entirely within the eastern Graham Island lowland.

Menyanthaceae

Leaves simple; corolla lobes erose-margined.....	*Fauria*
Leaves trifoliate; corolla lobes bearded.....	*Menyanthes*

Fauria

464. Fauria crista-galli (Menzies) Makino, Bot. Mag. Tokyo 18: 15. 1904.
Menyanthes crista-galli Menzies ex Hook., Bot. Misc. Hooker 1: 45. 1830; *Nephrophyllidium crista-galli* (Menzies) Gilg in Engler, Nat. Pfl. 4: 105. 1895.

GRAHAM ISLAND: near Tow Hill, *CST21168*, *CST22709;* Tan Mtn., *CST21608;* near Skidegate, *CST21685*, July 26, 1897, *Newcombe* (V); about 6 mi SE of Port Clements, *CST22078;* Langara Island, *CST22503;* Newton Pt., *CST22948;* Shields Bay, *CT23325;* about 9 mi SSE of Juskatla, *T67;* 12 mi N of Port Clements, *CTS34714;* White Creek Muskeg, *CTS34739;* about 15 mi S of Masset, *CT35570;* near Juskatla, May 31 and June 11, 1952, *Schmidt;* near Queen Charlotte City, July 5 and July 9, 1952, *Schmidt;* Long Inlet, July 25, 1897, *Newcombe* (CAN); Yakoun Lake, Aug. 1895, *Newcombe* (V).

MORESBY ISLAND: Chaatl Narrows, *CST21766;* Newcombe Peak, *CST22018;* Bigsby Inlet, *CST22161;* Echo Harbour, *CST22352;* Takakia Lake, *CST23100*, *Foster & Joslin 51* (UBC); Mt. de la Touche, *CT23583;* Anna Inlet, *CTS34934;* Upper Victoria Lake, *CT35731*, *CT35814;* Mt. Moresby, *CT37019*, July 13, 1961, *Foster & Bigg* (UBC).

Fauria is widely distributed on the Queen Charlotte Islands from sea level to near tree line. It is usually found in boggy habitats, but occasional plants were noted along margins of rocky runnels in the central mountain range. Plants growing in sphagnum in mature bogs rarely flower, but those along the margins of pools, rivulets, and lakes often flower profusely and produce abundant seed. The flowers have a rank odor and appear to be well adapted for pollination by beetles and flies.

Menyanthes

465. Menyanthes trifoliata L., Sp. Pl. 1: 145. 1753.

GRAHAM ISLAND: Yakan Pt., *CST21319;* Tan Mtn., *CST21586;* Jalun Lake, *CT35662;* 5 mi SE of Port Clements, *CST23467* (DAOM); near Skidegate, July 26, 1897, *Newcombe* (V).

MORESBY ISLAND: Bigsby Inlet, *CST22146;* Anna Inlet, *CTS34941;* Red Mud Marsh, *CT35365;* Upper Victoria Lake, *CT35768;* Sunday Inlet, *CT36583.*

Menyanthes trifoliata is a widely distributed bog–pool species on the Queen Charlotte Islands. Only a few extensive flowering and fruiting populations were observed during our two summer surveys spent on the Islands.

Convolvulaceae

Convolvulus

Leaves reniform, thick, fleshy; coastal sand beaches and dunes ..... *C. soldanella*
Leaves hastate to sagittate, never thick or fleshy; garden or field escape ..... *C. sepium*

466. *Convolvulus sepium L., Sp. Pl. 1: 153. 1753.

GRAHAM ISLAND: Queen Charlotte City, *CT36981.*

Convolvulus sepium was noted as an infrequent garden escape in vacant lots and along roadsides from Queen Charlotte City to Skidegate Village. However, this species is a common, well-established and rapidly spreading weed of similar habitats at Vancouver and Victoria in southwestern British Columbia.

467. Convolvulus soldanella L., Sp. Pl. 1: 159. 1753.

GRAHAM ISLAND: Tlell, *CTS34647, CT35427;* about 4 mi N of mouth of Oeanda River, *CT35852.*

This distinctive species of *Convolvulus* is restricted to the few extensive semistabilized sand-drift zones found behind driftwood along the east coast of Graham Island. No large colonies were observed. This plant was always in association with other rare beach species, e.g., *Abronia latifolia* Eschsch., *Lathyrus littoralis* (Nutt.) Endl., and *Senecio pseudo-arnica* Less. The collections from the Queen Charlotte Islands represent a considerable range extension from the previously recorded northern limit on Vancouver Island.

Polemoniaceae

Polemonium

468. Polemonium pulcherrimum Hook., Bot. Mag. 57. *pl.* 2979. 1830.

MORESBY ISLAND: Limestone Island, *CST22419*, June 9, 1913, *C. F. & W. A. Newcombe* (UBC, V).

Polemonium pulcherrimum is apparently a strict calciphile on the Queen Charlotte Islands and was found only on open, dry, limestone cliffs on the south side of Limestone Island (*see* Figure 95). Dr. C. F. Newcombe and his son collected this species, presumably from the same habitat, on the Island in 1913. Calcareous outcrops are rarely encountered in the Charlottes and consequently the distribution of the plant is restricted.

The occurrence of this species on the Islands poses an interesting problem

regarding its migration from the mainland. Hultén (1948) indicates that its only occurrence in southeastern Alaska is in the northern part of the Alaskan panhandle. In British Columbia it is not found along the coast, but is a species of interior. The presence of *P. pulcherrimum* with *Geranium richardsonii* indicates an unusual westward migration that is discussed in the Introduction.

Hydrophyllaceae

Romanzoffia

469. Romanzoffia sitchensis Bong., Mém. Acad. St. Pétersb. VI. 2: 156. 1832.

GRAHAM ISLAND: Long Inlet, *CT35995*.

MORESBY ISLAND: Takakia Lake, *CST23094*, *Foster & Joslin 56A* (UBC); Mt. de la Touche, *CT23568;* Mosquito Mtn., *CT23718;* between Cumshewa and Peel inlets, *CT35189;* Mt. Moresby, *CT35322*, *CT36396;* Tasu, June 1901, *Newcombe* (V); Gawi, May 30, 1901, *Newcombe* (CAN).

Romanzoffia sitchensis is quite common along the margins of rocky runnels and on open talus slopes in the Queen Charlotte Ranges from Mount Moresby south to Tasu Inlet. There are only two records from Graham Island. In June 1958, it was noted on Tan Mountain at the head of McClinton Bay (Masset Inlet), and in 1964 it was collected at about 600 ft in a steep rocky ravine at the head of Long Inlet west of Queen Charlotte City.

Boraginaceae

Flowers pale- or cream-yellow, or orange	
Plants annual; leaves erose-denticulate, spreading-hispid; flowers orange	*Amsinckia*
Plants perennial; leaves entire, appressed pubescent but not hispid; flowers pale- or cream-yellow	*Lithospermum*
Flowers white or blue	
Leaves ovate, obovate or spatulate, often glaucous, glabrous, succulent	*Mertensia*
Leaves lanceolate or oblanceolate, green, pubescent, not succulent.	
Inflorescence bracteate; nutlets covered with prickles	*Lappula*
Inflorescence ebracteate; nutlets smooth	*Myosotis*

Amsinckia

470. Amsinckia spectabilis Fisch. & Mey., Ind. Sem. Horti Petrop. 2: 26. 1836.
A. lycopsoides var. *bracteosa* A. Gray, Syn. Fl. N. Amer. 2: 198. 1878.
A. lycopsoides sensu Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 70. 1921.

GRAHAM ISLAND: Masset Spit, *CST21243*, *CST22631*, *CT35704;* Tow Hill, *CST22687;* Tlell, *CST23244*, *Pillsbury 395* (DAO, UBC); mouth of Kliki Creek, *CT36826;* Masset, July 1, 1901, *Newcombe* (V). Sept, 8, 1902, *Newcombe* (V).

MORESBY ISLAND: Sandspit, *CST21841*, *CT35349*, *CT36013*.

All collections of *A. spectabilis* from Vancouver Island and the Queen Charlotte Islands that we have examined have few- and small-flowered inflorescences in comparison with most collections we have seen from California. In addition, northern plants usually have a less scorpioid inflorescence, but it is doubtful that they represent an undescribed race as suggested by Cronquist (*in* Hitchcock *et al.*, 1959, p. 181). We have seen a few collections from California that are indistinguishable from those along the British Columbia coast. The flowers in this species have foliaceous bracts (var. *bracteosa* A. Gray) or are ebracteate, but there is no clear line of distinction between these two types.

In the Queen Charlotte Islands, *A. spectabilis* was found only on the sand and gravel beaches that extend from the spit at Haida on the north coast of Graham Island to Sandspit at the northeast tip of Moresby Island. It is strictly a coastal species confined to the upper limits of the beaches and often grows among logs and driftwood, which afford its shallow root system some protection from buffeting winds. Long stretches of the coast line, especially the rocky shore of the west coast, lack suitable habitats. There are no records from the adjacent mainland nor the Alaska panhandle, but Hultén's (1949*a*, p. 1353) records for *A. lycopsoides* Lehm. and *A. menziesii* (Lehm.) Nels. & Macbr. cited under Eastern Pacific Coast District should be verified.

Lappula

471. *Lappula echinata Gilib., Fl. Lithuan. 1: 25. 1781.

MORESBY ISLAND: Sandspit, *CT36025*.

This species was noted only at Sandspit in the weed-infested garden of an abandoned house and along a roadside ditch on the southern outskirts of the townsite.

Lithospermum

472. *Lithospermum officinale L., Sp. Pl. 1: 132. 1753.

GRAHAM ISLAND: Tlell, *CST21806*, *CT35433*.

In 1957 a single immature plant of *L. officinale* was found near the Richardson Ranch at Tlell, where it was growing at the margin of coniferous woods back from the dunes bordering the beach. This species was also noted in the

Tlell area in the 1964 survey. A few scattered plants were located on stabilized sand ridges immediately behind the driftwood zone about a mile from the mouth of the Tlell River. These records are apparently the first of this species for Canada west of Manitoba.

Mertensia

473. Mertensia maritima (L.) S. F. Gray, Nat. Arr. Brit. Pl. 2: 354. 1821.

GRAHAM ISLAND: Masset Spit, *CST21231*, *CST22783* (DAOM), *CTS34724;* Yakan Pt., *CST21309;* Lepas Bay, *CST22596;* near Tow Hill, *CST22688;* Jungle Beach, *CST23397;* Tlell, *Pillsbury 394* (DAO, UBC); about 4 mi N of mouth of Oeanda River, *CT35850;* Masset, 1925, *Young* (V); Skidegate, June 1901, *Newcombe* (V); Sisk, June 4, 1913, *Newcombe* (UBC, V).

MORESBY ISLAND: Sandspit, *CST21839*, *CT35156*.

The collections of *M. maritima* from the Islands undoubtedly represent the southern limit of this northern species along the Pacific coast of North America. The plant has been reported by Hultén (1949*a*, p. 1359) and Eastham (1947, p. 92) as occurring at Nootka, Vancouver Island on the basis of a collection made by Haenke in 1791; however, this record is probably in error. A number of other species (e.g. *Poa eminens* Presl) supposedly collected at this locality by Haenke and reported by Presl in his *Reliquiae Haenkeanae* would represent considerable range extensions to the south. As far as we are aware these species have never been re-collected in this region and it seems reasonable to assume that these early collections were made farther north along the coast.

Mertensia maritima is essentially restricted to the *Elymus mollis* and driftwood zones of gravel beaches along the east and northeastern coasts of Graham Island and Sandspit region of Moresby Island. Exceptions to this distribution pattern are: Lepas Bay and Sisk from the west coast of Graham Island, and a small colony on a gravel beach near the wharf at Port Clements in Masset Inlet. This latter record is based on a sight observation made during our 1957 survey, but on revisiting this station in 1964 we were unable to find any plants.

Myosotis

Calyx spreading pubescent, hairs straight above, uncinate below; moist or dry gravelly habitats..... *M. arvensis*
Calyx appressed pubescent, hairs stiff, straight and sharp, never uncinate; wet habitats
  Corolla 2–5 mm broad; style much exceeded by nutlets and calyx; annual or biennial..... *M. laxa*
  Corolla 6–9 mm broad; style overtopping nutlets and exserted from calyx; perennial..... *M. scorpioides*

474. *Myosotis arvensis (L.) Hill, Veg. Syst. 7: 55. 1764.

GRAHAM ISLAND: Queen Charlotte City, *CT35844.*

MORESBY ISLAND: near Alliford Bay, *CST21074, CST21829.*

Myosotis arvensis is a European introduction that occurs on roadside banks and in disturbed gravelly habitats. It probably occurs near other settlements in the eastern sections of Graham and Moresby islands.

475. Myosotis laxa Lehm., Asperif. 1: 83. 1818.

GRAHAM ISLAND: 3 mi NW of Tlell, *CST22068;* near Yakoun River Delta, *CT35462;* near mouth of Oeanda River, *CT35896;* Yakan Pt., *CT36809.*

MORESBY ISLAND: between Skidegate Lake and Copper Bay, *CT35276;* Copper Bay, *Foster & Joslin 17* (UBC).

This species is found occasionally in swamps, along the margins of pools and in other wet habitats in the lowlands of eastern Graham and northeastern Moresby islands. It occurs sporadically and rarely forms a conspicuous element of the vegetation.

476. *Myosotis scorpioides L., Sp. Pl. 1: 131. 1753.

GRAHAM ISLAND: Skidegate Village, *CT36961.*

MORESBY ISLAND: Copper Bay, *CST20971, Joslin 36* (UBC); Sandspit, *CST21815, CT36022.*

Myosotis scorpioides is poorly represented in our collections and probably is more widely distributed near settlements in the eastern section of the Islands than indicated by the few localities cited. It is found in mucky seepage areas, stagnant ponds and along river margins.

Labiatae

Corolla over 1 cm long
- Calyx lobes with conspicuous stiff apical spines; stems usually laterally branched ..... *Galeopsis*
- Calyx lobes spinulose but the spines never stiff or conspicuous; stems usually simple
  - Leaves regularly and conspicuously crenate; flowers pink ..... *Stachys*
  - Leaves entire or irregularly and weakly crenate; flowers purple ..... *Prunella*

Corolla less than 1 cm long
- Plants with shallow tubers, stoloniferous, not aromatic; leaves coarsely toothed; flowers white ..... *Lycopus*

Plants rhizomatous, aromatic; leaves crenate or serrate; flowers rarely white..... *Mentha*

Galeopsis

477. *Galeopsis tetrahit L., Sp. *Pl.* 2: 579. 1753.

GRAHAM ISLAND: Masset, *CT36832;* Port Clements, *CT36890;* Queen Charlotte City, *CT36973.*

MORESBY ISLAND: Sandspit, *CT23678.*

In the recent *Flora of the British Isles* (Clapham *et al.*, 1962) *G. bifida* Boenn. (= *G. tetrahit* var. *bifida* (Boenn.) Lej. & Court.) and *G. tetrahit* have been included in the *G. tetrahit* aggregate. Such a treatment implies a close degree of similarity but a lack of agreement regarding the taxonomic disposition of the two entities. A detailed biosystematic study is needed to clarify the relationships. We are tentatively following Cronquist (*in* Hitchcock *et al.*, 1959 p., 251) and recognize the material from the Islands as belonging to *G. tetrahit* in the broad sense.

Galeopsis is not a common element of the weedy flora of the Islands and was never noted in large colonies.

Lycopus

478. Lycopus uniflorus Michx., Fl. Bor.-Amer. 1: 14. 1803.

MORESBY ISLAND: E end of Skidegate Lake, *CST23415;* Skidegate Lake Bridge, *CT35151.*

Although *L. uniflorus* was only found along the wet, grassy shorelines of Skidegate Lake, it probably occurs sporadically throughout the lowlands of eastern Graham and Moresby islands. It is a late-flowering species of open, moist habitats, especially lake shores and river courses, and apparently cannot tolerate the dense shade of the climax spruce–hemlock forest that covers most of the lowland region.

This species is widely distributed in North America and extends to Siberia and Japan. In a recent monograph of *Lycopus*, Henderson (1962) cites numerous localities for this species along the North American Pacific coast.

Mentha

Stems pubescent on the angles; leaves acute; stamens exserted..... *M. arvensis*
Stems glabrous; leaves blunt; stamens included..... *M. citrata*

479. Mentha arvensis L., Sp. Pl. 2: 577. 1753.
M. canadensis L., *l.c.; M. arvensis* var. *canadensis* (L.) Kuntze, Rev. Gen. 2: 254. 1891.
M. canadensis var. *glabrata* Benth., Lab. Gen. & Sp. 181. 1833.

GRAHAM ISLAND: Yakoun River 16 mi S of Juskatla, *CT35499.*

MORESBY ISLAND: between Copper Bay and Skidegate Lake, *CT23669;* Sandspit, *CT36039;* Skidegate Lake, *CT36736.*

A number of infraspecific segregates based essentially on leaf shape and the type and density of stem pubescence have been recognized for *M. arvensis.* However, these morphological characters are so variable in the series of collections examined from British Columbia that we have found it impossible to realistically assign them to any of the proposed segregates.

Mentha arvensis is of local occurrence in the Queen Charlotte Islands. It is restricted to the lowlands of northeastern Moresby Island, but there is an isolated record from wooded flats along the Yakoun River south of Juskatla.

480. *Mentha citrata Ehrh., Beitr. 7: 150. 1792.

GRAHAM ISLAND: Skidegate Village, *CT36959.*

Mentha citrata has never been widely introduced into North America but it has long been cultivated in the British Isles as a source of peppermint. It was undoubtedly introduced many years ago at Skidegate Village and it has subsequently become well-established in and along the margins of the small creek that flows through the townsite.

Prunella

481. Prunella vulgaris L., Sp. Pl. 2: 600. 1753.

GRAHAM ISLAND: between Skidegate and Skidegate Village, *CST21413, CST21711;* Tow Hill, *CST22661;* Mamin River Delta, *T130;* 3 mi N of Port Clements, *T137;* Image Pt., *CT35387;* Yakoun Lake, *CT36770;* Queen Charlotte City, *Foster & Joslin 25* (UBC); Long Inlet, July 27, 1897, *Newcombe* (CAN); Skidegate, May 1901, *Newcombe* (V).

MORESBY ISLAND: Echo Harbour, *CST22317;* Limestone Island, *CST22399;* Mosquito Lake, *CT35305;* Mt. Moresby, *CT36433;* Sunday Inlet, *CT36616.*

Prunella vulgaris was found in and around settlements and in native undisturbed habitats throughout the lowlands of the Queen Charlotte Islands. The indigenous North American plant has been recognized as a distinct variety or subspecies by a number of authors, but we are unable to distinguish between the introduced and native populations on the Islands.

Stachys

482. Stachys cooleyae A. Heller, Bull. Torrey Club 26: 590. 1899.
S. ciliata sensu Henry, Fl. South. B. C. 259. 1915.
S. ciliata var. *pubens sensu* Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 72. 1921.

GRAHAM ISLAND: west of Queen Charlotte City, *CST22461*, *CST23001* (DAOM), July 2, 1952, *Schmidt;* Lawn Pt., *CT35440*.

MORESBY ISLAND: Copper Bay, *CT23644;* between Cumshewa and Peel inlets, *CT35186;* Sandspit, *CT36035;* near Moresby Logging Camp, *CT36704;* Pacofi Bay, *Foster & Joslin 87B* (DAO, UBC); Kaisun, July 15, 1897, *Newcombe* (CAN).

The nomenclatural problems with respect to *S. cooleyae* and the closely related *S. mexicana* Benth. have recently been discussed by Cronquist (*in* Hitchcock *et al.*, 1959, p. 275) and we are following his treatment. We have examined a large series of specimens of this complex from the coastal regions of British Columbia and have concluded that all collections should be referred to *S. cooleyae*, a robust plant with deep reddish-purple flowers up to 25 mm long. Cronquist states that the smaller-flowered and less robust *S. mexicana* is distributed as far north as the southern part of the province, but perhaps this range extension is based on the tenuous inclusion of *S. ciliata* var. *pubens* A. Gray in the synonymy of *S. mexicana*. This variety is based on a collection from along the Fraser River and Cronquist points out that an isotype examined at New York suggests a hybrid between a coastal taxon, i.e., *S. cooleyae* or *S. mexicana*, and the interior *S. palustris* L. We have observed a similar presumed hybrid from near Terrace, but *S. mexicana* can be ruled out as one of the parents as it does not occur this far north. It seems apparent that *S. cooleyae* is one of the parents of var. *pubens*. Hultén reports *S. emersonii* Piper (= *S. mexicana*) from the Alaska panhandle, but this record undoubtedly represents *S. cooleyae*.

The distribution of *S. cooleyae* on the Charlottes appears to be essentially restricted to logged-over areas and thickets on the eastern side of the Islands. It is rarely a conspicuous or dominant element of the vegetation.

Scrophulariaceae

Leaves pinnatifid ..... *Pedicularis*
Leaves never pinnatifid
  Leaves alternate
    Leaves sessile ..... *Castilleja*
    Lower leaves petiolate ..... *Digitalis*
  Leaves opposite, occasionally the uppermost alternate
    Corollas galeate; calyx conspicuously inflated in fruit *Rhinanthus*
    Corollas never galeate; calyx never conspicuously inflated
      Corollas yellow, more than 2 cm long: calyx shallowly 5-cleft ..... *Mimulus*
      Corollas never yellow, less than 1 cm long; calyx deeply 5-cleft or the sepals essentially distinct
        Functional stamens 4 ..... *Collinsia*
        Functional stamens 2 ..... *Veronica*

Leaves ovate to obovate in outline, conspicuously 3- to 7-lobed, the lowermost occasionally entire ..... *C. parviflora*

Leaves linear to narrowly ovate, entire, the uppermost occasionally inconspicuously lobed

Bracts yellow or yellowish; membranous margin of the galea yellow ..... *C. unalaschensis*

Bracts red or reddish; membranous margin of the galea red ..... *C. hyetophila*

483. Castilleja hyetophila Pennell, Proc. Acad. Phila. 86: 537. 1934.
C. miniata sensu Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 72. 1921.

GRAHAM ISLAND: near Haida, *CST22778*.

MORESBY ISLAND: Skincuttle, June 1901, *Newcombe* (V).

Pennell considered *C. hyetophila* to be an endemic of the southeastern coast of Alaska. He recognized this new species as part of the *C. miniata* complex and stated that it was closely related to *C. dixonii* Fernald of the British Columbia and Washington coast. Ownbey (*in* Hitchcock *et al.*, 1959, p. 312), in a more recent treatment of this genus, considers *C. dixonii* to be a poorly marked seaside ecotype of *C. miniata* and states that "no satisfactory criteria have been found for distinguishing *C. dixonii* and *C. miniata* . . . ."

In 1961, an extensive series of *C. miniata* (*s.l.*) was obtained from Vancouver Island. Characters of *C. dixonii* were evident in plants restricted to rocky sea bluffs and beaches along the west coast of the island from Cape Scott to the vicinity of Sooke near Victoria. This coastal form with its thickish leaves and prominently rounded bracts is sometimes sharply distinct and thus separable from inland *C. miniata*, but it also shows all degrees of intergradation with the latter.

Although we agree with Ownbey that *C. dixonii* is nothing more than an ecophenotype of *C. miniata* and should be relegated to synonymy, there is some doubt as to the status of *C. hyetophila*. This later taxon, which has rounded bracts, is undoubtedly related to the *C. dixonii* phase of *C. miniata*. Furthermore, the character used by Pennell in separating *C. hyetophila* from *C. miniata*, i.e., calyces cleft one-half to two-thirds the length compared with one-half the length, is not completely reliable because two collections of *C. miniata* from Vancouver Island have their calyces cleft well over one-half their length. However, our material of *C. hyetophila* is not sufficient to enable us to define its status and for the time being we prefer to regard it as a species.

Our collection is from upper limits of a gravel beach east of the spit at Haida.

484. Castilleja parviflora Bong., Mém. Acad. St. Pétersb. VI. 2: 158. 1832.

MORESBY ISLAND: Newcombe Peak, *CST22016;* Takakia Lake, *CST23083, CT36280;* Mt. de la Touche, *CT23576;* Mosquito Mtn., *CT36458,* July 13, 1961, *Foster & Bigg* (UBC).

The six collections cited belong to the northern ssp. *parviflora.* This subspecies is widely distributed in the Coast Mountains, and there is a disjunct population in the Rocky Mountains between 54° and 58°N.

Castilleja parviflora is restricted to alpine or subalpine habitats in the Queen Charlotte Ranges. It is common on open heathy slopes and rocky habitats on the mountains around Takakia Lake and on Mosquito Mountain.

485. Castilleja unalaschensis (Cham. & Schlecht.) Malte, Rhodora 36: 187. 1934.
C. pallida sensu Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 72. 1921.
C. unalaschensis ssp. *transnivalis* Pennell, Proc. Acad. Phila. 86: 537. 1934.

GRAHAM ISLAND: Haida Pt., *CST20879;* between Skidegate and Skidegate Village, *CST21419, CTS34667;* Rose Spit, *CST21219A;* mouth of Sangan River, *CST21150;* Tlell, *CST21363;* July 24, 1925, *W. A. Newcombe* (V); Yakoun River Delta, *CST21552;* Lepas Bay, *CST22603;* Skidegate, June 1901 and May 26, 1923, *Newcombe* (V); Hippa Island, June 6, 1913, *Newcombe* (V); Dawson Harbour, June 24, 1897, *Newcombe* (CAN).

MORESBY ISLAND: islet off Bolkus Islands, *CST22224;* Skedans, *CST22426;* Takakia Lake, *CST23123;* Tuft Islets, *CTS34860;* Low Island, *CTS35002;* between Cumshewa and Peel inlets, *CT35183;* Yatza Mtn., *CT35716;* Limestone Island, June 9, 1913, *Newcombe* (UBC, V).

Castilleja unalaschensis is common on rocky sea bluffs along the upper limits of beaches on the outer coasts and in Masset Inlet, but occasionally it occurs in subalpine habitats. It is essentially a lowland species that is widely distributed along the Alaska coast. It extends inland to the Nisutlin Plateau and Cassiar Mountains of the southern Yukon. The southern limit for this species in British Columbia is not known but we have a collection from the Bulkley Ranges (Red Rose Tungsten Mine near Skeena Crossing, *Calder et al. 13384*) in the Skeena River drainage. Hybrids between this species and *C. miniata* Dougl. have been collected at the above mentioned locality and at Bella Coola to the south.

Pennell (1934, p. 537) considered the inland plant of extreme northwestern British Columbia and southern Yukon to represent a distinct race (ssp. *transnivalis*) with smaller leaves, corollas and bracts. Although the interior plant tends to be less robust than the coastal one the differences are not constant and we agree with Porsild (1951, p. 285) that Pennell's subspecies should be relegated to synonymy.

The collection on which Carter and Newcombe based their report of *C. pallida* (L.) Sprengel from the Queen Charlotte Islands is in the herbarium of the National Museum in Ottawa. This collection was made by Dawson in 1878 but there are no data as to its exact locality.

Collinsia

486. Collinsia parviflora Dougl. ex Lindl., Bot. Reg. 13. *pl.* 1082. 1827.

GRAHAM ISLAND: Haida Pt., *CST20873;* Tlell, *CST21370;* 1 mi w. of Queen Charlotte City, *CT35415;* Skidegate Inlet, June 4, 1897, *Newcombe* (CAN); Skidegate, July 3, 1902 and May 24, 1923, *Newcombe* (V); Lina Island, May 17, 1961, *Foster & Bigg* (UBC).

MORESBY ISLAND: between Sandspit and Cape Chroustcheff, *CST21018;* Alliford Bay, *CST21069;* South Low Island, *CTS34843;* Limestone Island, *CTS34858;* Low Island, *CTS35012;* Tasu, June 2, 1901, *Newcombe* (V).

This species is common on open, grassy bluffs bordering Skidegate Inlet and in similar habitats on South Low, Low, and Limestone islands. A few plants were found along a bank of the Tlell River, and it occurred sparingly in sandy soil back from the beach dunes just south of Sandspit. The Tasu collection by Newcombe may represent a chance introduction of this species on the west coast.

Plants from the interior of the province are usually small flowered with corollas less than 6 mm long. In the Coast Mountains and along the coast, plants tend to be more robust and larger flowered. There is probably introgression where this species and the closely related *C. grandiflora* Lindl. meet on southern Vancouver Island.

Collinsia parviflora is widely distributed throughout central and southern British Columbia. In the coastal region it extends to the northern part of the Alaska panhandle, and east of the Coast Mountains it has been found as far north as the extreme southern part of Yukon.

Digitalis

487. *Digitalis purpurea L., Sp. Pl. 2: 621. 1753.

GRAHAM ISLAND: Tow Hill, *CST22684;* Queen Charlotte City, *CST23036;* 2½ mi S of Masset, *CT36836.*

MORESBY ISLAND: between Harriet Harbour and Huston Inlet, *CST22244;* Skidegate Lake, *CT35281;* Alliford Bay, *CT34681;* 2 mi W of Skidegate Lake, *CT36703;* Hotspring Island, *Foster & Joslin 85, 86B* (UBC).

Digitalis purpurea is a common species along roadsides and in disturbed areas throughout the eastern half of the Queen Charlotte Islands. It was noted in a number of out-of-the-way places along the east coast of Moresby Island, where it has persisted many years near abandoned settlements, canneries, and camp sites. The corollas are purplish or occasionally white, and conspicuously spotted and mottled on the lower side.

Digitalis purpurea has been widely introduced in the coastal region of mainland British Columbia but apparently has not become established east of the Coast Mountains, where the weather is more severe.

Mimulus

488. Mimulus guttatus DC., Cat. Pl. Hort. Monsp. 127. 1813.

Leaves obtuse, irregularly dentate, veins on abaxial surface essentially glabrous, adaxial surface glabrous or sparsely villous-glandular; pedicels and upper internodes villous-glandular ..... ssp. *guttatus*

Leaves acute, regularly dentate, veins on abaxial surface puberulous, adaxial surface often puberulous but never glandular; pedicels and upper internodes puberulous ..... ssp. *haidensis*

488a. Mimulus guttatus DC. ssp. **guttatus. Figures 169-171.**

M. langsdorffii Donn in Sims, Bot. Mag. *pl.* 1501. 1812, as a synonym of *M. luteus* Donn, *l.c.*

M. langsdorffii var. *guttatus* (D.C.) Jepson, Fl. W. Middle Calif. 406. 1901.

M. nasutus sensu Henry, Fl. South. B.C. 269. 1915.

GRAHAM ISLAND: Haida Pt., *CST20865;* Queen Charlotte City, *CST22481;* 2 mi w of Tow Hill, *CST22725;* Image Pt., *CTS34675;* near mouth of Oeanda River, *CT35901;* near Millar Creek, *T134;* about 3 mi N of Port Clements, *T140;* MacIntosh Meadows, Aug. 23, 1961, *Foster & Bigg* (UBC).

MORESBY ISLAND: Copper Bay, *CST20969*, *Foster & Joslin 21* (UBC); small islet at mouth of Huston Inlet, *CST22194;* Skedans Islands, *CST22389;* mouth of Deena River, *CT23800;* Limestone Island, *CTS34816*, June 9, 1913, *Newcombe* (UBC); Kaisun, *CT36535;* Gowdas Islands, *CT36577;* Horn Rock, Aug. 9, 1957, *Mills;* islet near Bolkus Islands, *Foster & Joslin 83* (UBC); Church Creek, June 8, 1952, *Pillsbury* (UBC).

488b. Mimulus guttatus DC. ssp. **haidensis** Calder & Taylor, Can. J. Bot. 43: 1398. 1965. **Figures 172-174.**

GRAHAM ISLAND: Lepas Bay, *CST22624;* Shields Bay, *CT23345;* near Yakoun River 4½ mi SW of Port Clements, *CTS35035;* Mamin River Delta, *T112.*

MORESBY ISLAND: Takakia Lake, *CST23063*, *CT36284;* Mosquito Mtn., *CT23697;* between Cumshewa and Peel inlets, *CT35184;* Mt. Moresby, *CT36391.*

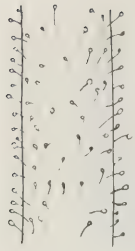
Mimulus guttatus, a widely distributed polymorphic species of western North America, was first described from plants grown from seed sent by Langsdorff from Unalaska. The northern British Columbia and Alaska lowland coastal populations are quite uniform and all collections that we have seen from this region belong to the typical phase. On the Queen Charlotte Islands, a distinctly puberulous nonglandular race is found in and along the flanks of the Queen Charlotte Ranges. This entity, ssp. *haidensis*, described in a recent publication (Calder and Taylor, 1965), is an endemic subalpine race of the more



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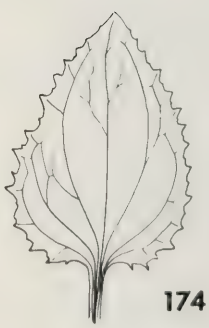
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174

Figures 169–174. 169. *Mimulus guttatus* DC. ssp. *guttatus*, cauline leaf (× ½). 170. *M. guttatus* ssp. *guttatus*, cauline leaf (× ½). 171. *M. guttatus* ssp. *guttatus*, pubescence on pedicel (× 8). 172. *M. guttatus* ssp. *haidensis* Calder & Taylor, habit (× ⅓). 173. *M. guttatus* ssp. *haidensis*, pubescence on pedicel (× 8). 174. *M. guttatus* ssp. *haidensis*, cauline leaf (× ½).

widespread lowland ssp. *guttatus*. It was found in rocky runnels and along wet mossy margins of alpine rivulets. A few isolated collections were made on margins of streams that have their headwaters in the main spine of the Queen Charlotte Ranges. Such collections are undoubtedly plants produced from seeds, or plants themselves, that have been carried down the streams during periods of high run-off in the spring and summer months.

The typical race, ssp. *guttatus*, is a common element of the lowland coastal flora. It is usually a large, robust, many-flowered plant, but occasional depauperate, single-flowered plants are found on exposed rock outcrops along the coast. Late-flowering plants are often small and few-flowered.

Pedicularis

Cauline leaves verticillate; flowers light violet..... *P. verticillata*
Cauline leaves opposite or alternate
  Galea prominently beaked; flowers deep purplish-violet..... *P. ornithorhyncha*
  Galea beakless
    Galea with a conspicuous glandular tooth midway along lower margin, minute subapical teeth often present; stems usually branched; galea dark violet, corolla tube and lower lip light purplish-violet..... *P. pennellii*
    Galea lacking a conspicuous glandular tooth midway along lower margin, subapical teeth absent; stems always simple
      Spike narrow, somewhat open, sparsely hirsute; flowers light yellow with a deep purple blotch towards the tip of the galea..... *P. oederi*
      Spike broad, congested, conspicuously lanate; flowers light violet-purple..... *P. lanata*

489. Pedicularis lanata Cham. & Schlecht., Linnaea 2: 584. 1827.

GRAHAM ISLAND: Mt. Needham area, June 18, 1961, *Foster & Bigg* (UBC); Dawson Harbour, June 1901, *Newcombe* (V).

MORESBY ISLAND: Takakia Lake, *CT36293;* Tasu Inlet, June 26, 1961, *Foster & Bigg* (UBC); Security Cove, June 19, 1959, *Brown* (V).

Pedicularis lanata, a rare species in the Queen Charlotte Islands, ranges from the mountain mass immediately north of Skidegate Channel south to Tasu Sound. We did not find this species in 1957, but three collections were made in the Queen Charlotte Ranges during the years 1959 and 1961 by other collectors. In the 1964 survey a few scattered plants were found on a windswept rocky ridge above the northwest side of Takakia Lake.

Pedicularis lanata is at or near the southern limit of its Pacific coast range in the Queen Charlotte Islands. We have not seen any collections from the adjacent Coast Mountains, but Raup (1947) in a distribution map has indicated its presence in the Bella Coola region. This record has not been checked, but such a coastal distribution closely parallels that of *Gentiana platypetala* Griseb.

490. Pedicularis oederi Vahl in Hornem, Dansk Oekonom. Plantel. ed. 2. 580. 1806.

GRAHAM ISLAND: Tan Mtn., *CST21577;* Jalun Lake, *CT35639.*

MORESBY ISLAND: Newcombe Peak, *CST22017;* Takakia Lake, *CST-23088, CT36274;* Mosquito Mtn., *CT23694A, CT36470;* Yatza Mtn., *CT35724.*

Pedicularis oederi on the Queen Charlotte Islands tends to be taller (25 cm or more) and more robust than plants from the mainland. However, in comparing the Charlotte material to that on the mainland from Alaska, Yukon and British Columbia, we can find no consistent differences between them. The robust plants from the Islands have broad leaves and large flowers and probably represent environmental phenotypes. We have also examined a number of collections from Eurasia and in comparison to the North American material they have leaves which tend to have more closely set, broader lobes and more conspicuous rachises. A detailed study of this species might reveal some well-defined races.

Pedicularis oederi is a rare species in the Queen Charlottes, usually restricted to cliffs and shallow rocky runnels from well below tree line to alpine slopes. It also occurs sporadically in the Alaska panhandle and its southern limit along the Pacific coast is on the Charlottes. There are no records from the interior of British Columbia, but there are scattered stations in the Rocky Mountains as far south as Montana and Wyoming.

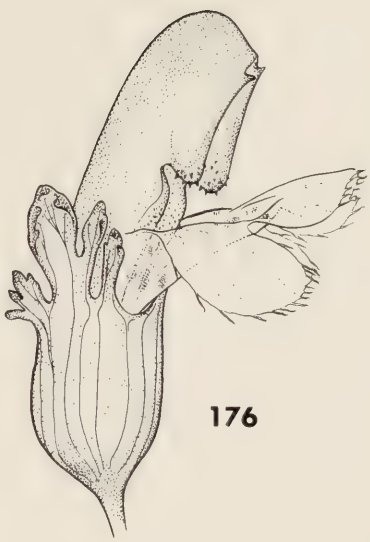
491. Pedicularis ornithorhyncha Benth. in Hook., Fl. Bor-Amer. 2: 108. 1838.
P. pedicellata Bunge, Bull. Acad. Sci. St. Pétersb. 8: 250. 1841.

GRAHAM ISLAND: Empire Anchorage, *CS21530B;* between Ells and Mercer pts., *CST22880A;* Newton Pt., *CST22979;* Shields Bay, *CT23351.*

MORESBY ISLAND: Takakia Lake, *CST23068, CT36275, Foster & Joslin 63* (UBC); Mosquito Mtn., *CT23705, CT36456,* 1961, *Foster & Bigg* (UBC); Anna Inlet, *CTS34944;* Mt. Moresby *CT36494;* Tasu Inlet, June 6, 1961, *Foster & Bigg* (UBC).

Pedicularis ornithorhyncha is a very uniform and widely distributed species in the Coast Mountains from the northern part of Alaska panhandle south to Mount Rainier in Washington State. It is common in alpine meadows in the Queen Charlotte Ranges and extends down to sea level on exposed, windswept slopes along the west coast of the Islands.





Figures 175–176. *Pedicularis pennellii* Hult. ssp. *insularis* Calder & Taylor. 175. Habit (× ½). 176. Flower (× 3½).

492. Pedicularis pennellii Hult. ssp. **insularis** Calder & Taylor, Can. J. Bot. 43: 1399. 1965. **Figures 175 and 176.**

GRAHAM ISLAND: Empire Anchorage, *CS21531;* Newton Pt., *CST-22978.*

MORESBY ISLAND: Chaatl Narrows, *CST21754;* Mosquito Mtn., *CT23725, CT36450.*

Pedicularis pennellii Hult. is closely related to *P. parviflora* Smith, but it can readily be distinguished from this species by the presence of a smaller lip and a galea that usually has conspicuous teeth or protuberances near the apex. There is also a tendency for *P. pennellii* to be shorter and to have smaller leaves and flowers. The leaves are often conspicuously bipinnatipartite in *P. pennellii*, while those of *P. parviflora* are essentially pinnatifid. *Pedicularis pennellii* comprises two races: ssp. *pennellii*, which occurs from the base of the Alaska Peninsula northwards along the Bering Sea coast to Bering Strait, inland in the Brooks Range to Uniat and Anaktuvuk Pass, and in eastern Asia; and ssp. *insularis*, which is endemic to the Queen Charlotte Islands. Subspecies *pennellii* is characterized by flowers possessing two prominent ciliate teeth near the apex of the galea, in contrast those of ssp. *insularis* in which the galea is entire or has rudimentary protuberances in the same place on the galea that the ciliate teeth are found in ssp. *pennellii*. The morphological differences between plants from the Charlottes and the Bering Sea area are slight but they are significant when coupled with the disjunction between the two populations. In our view the plant of the Queen Charlotte Islands warrants formal taxonomic recognition.

Pedicularis pennellii ssp. *insularis* is one of the rarest elements of the subalpine vegetation on the Charlottes. No large colonies were observed and only a few plants were seen at each of the five stations where we collected them. It was found only on open or partially shaded wet boggy mountain slopes.

493. Pedicularis verticillata L., Sp. Pl. 2: 608. 1753.

GRAHAM ISLAND: Empire Anchorage, *CS21530A.*

MORESBY ISLAND: Takakia Lake, *CST23067, CT36301, Foster & Joslin 48* (DAO, UBC), *Foster & Joslin 64* (UBC); Mosquito Mtn., *CT23717;* Mt. Moresby, *CT35317, CT36423,* Mt. Russ, *CT36176;* Sunday Inlet, *CT36592.*

Pedicularis verticillata occurs sporadically throughout the Queen Charlotte Ranges. It is usually found in subalpine and alpine meadows, but was collected near sea level along the west coast on open, wet, windswept slopes at Empire Anchorage and at the head of Sunday Inlet. Below the north face of Mount Moresby it is common on cliff ledges and rocky slopes at about 500 ft. In the Charlottes it is an extremely variable species with respect to the size and shape of the inflorescence; the arrangement, size and color of the flowers; and the shape and cutting of the leaves. However, plants from the Charlottes are well within the normal range of variations as it occurs in a large series of specimens

from Europe, Asia, Alaska, and Yukon. It is at the southern limit of its North American range in the Islands.

A Green collection in the University of British Columbia herbarium labeled Tlell River, about 1912, is almost certainly in error as to locality.

Rhinanthus

494. Rhinanthus crista-galli L., Sp. Pl. 2: 603. 1753.

GRAHAM ISLAND: Tlell area, *CST22821*, *CT35927*, *CT36881*.

There is little unanimity in the treatment of *Rhinanthus* in North America with respect to number of species and their relationship to those that occur in the Old World. As species concepts are at such variance, we are tentatively referring all material from the Pacific Northwest to *R. crista-galli*. (*See* brief discussion by Cronquist in Hitchcock *et al.*, 1959, p. 411.)

Rhinanthus, a rare plant on the Islands, was found only in the vicinity of Tlell. Dawson (1880, p. 221B) reported this species from the Charlottes in a list of plants collected in 1878, but unfortunately gave no locality. In spite of its rarity on the Islands, *Rhinanthus* is widely distributed on the British Columbia mainland and numerous localities are recorded from the southern part of the Alaska panhandle to the Aleutian Islands.

Veronica

Flowers in axillary racemes
- Leaves sessile, linear to narrowly lanceolate, entire or obscurely and remotely toothed ..... *V. scutellata*
- Leaves petiolate, lanceolate to ovate, conspicuously toothed ..... *V. americana*

Flowers solitary or in terminal racemes
- Flowers long-pendunculate, solitary in the axils of bracts similar to the cauline leaves ..... *V. filiformis*
- Flowers short-pedunculate in terminal racemes
  - Annuals
    - Leaves and stems glabrous or glandular-puberulent, leaf margins essentially entire; styles about 0.1 mm long ..... *V. peregrina*
    - Leaves and stems conspicuously pubescent, leaf margins crenate; styles more than 0.5 mm long ..... *V. arvensis*
  - Perennials
    - Racheae and stems puberulent with incurved hairs; inflorescence diffuse, many-flowered; capsules broader than long ..... *V. serpyllifolia*
    - Racheae and stems sparsely to densely villous; inflorescence congested, few-flowered; capsules longer than broad ..... *V. wormskjoldii*

495. Veronica americana Schwein. ex Benth. in DC., Prodr. 10: 468. 1846.

GRAHAM ISLAND: Yakan Pt., *CST21316*, *CST22727;* 3 mi N of Lawnhill, *CST21727;* Kumdis Creek, *CST22112;* Langara Island, *CST22588;* Mamin River Delta, *T116;* near Yakoun River 4½ mi S of Port Clements, *CTS35037;* Masset, 1929, *Young* (V).

MORESBY ISLAND: near Alliford Bay, *CST21853;* between Copper Bay and Skidegate Lake, *CT35277;* Copper Bay, *Foster & Joslin 20* (UBC); Copper Creek, *Foster & Joslin 43*, *44* (UBC); Kaisun, July 15, 1897, *Newcombe* (CAN).

Veronica americana is common in open, wet habitats especially near the coast. Although there are no records south of Kaisun and Skidegate Lake, it probably extends to the southern end of Moresby Island.

496. *Veronica arvensis, L., Sp. Pl. 1: 13. 1753.

GRAHAM ISLAND: Skidegate, *CST22455;* Massey Spit, *CTS34728;* between Queen Charlotte City and Skidegate, *CTS34779.*

MORESBY ISLAND: Alliford Bay, *CST21054;* Sandspit, *CT35331.*

Veronica arvensis is widely introduced in southern British Columbia and is well established in many places along the coast. On the Queen Charlotte Islands it is common along roadsides and in disturbed habitats in the settlements bordering Skidegate Inlet. A few plants were found on the gravel spit at Haida and it was noted in meadows at Tlell.

497. *Veronica filiformis Sm., Trans. Linn. Soc. 1: 195. 1791.

MORESBY ISLAND: Sandspit, *CST20998.*

In 1957 a few colonies of *V. filiformis* were found on a grassy roadside bank near the airport at Sandspit. When we revisited this station in 1964 the roadside shoulders had been recently mowed and the species could not be relocated. The only other British Columbia record for this species in our institute herbarium is from the banks of the Thompson River at Kamloops.

Veronica filiformis has become an aggressive lawn weed at a few stations in southern Quebec and Ontario. Cronquist (*in* Hitchcock *et al.*, 1959, p. 419) reports that it has become established at Bellingham and Seattle in Washington.

498. Veronica peregrina L. ssp. **xalapensis** (H.B.K.) Pennell, Torreya 19: 167. 1919.

MORESBY ISLAND: islet off Bolkus Islands, *CST22232.*

Veronica peregrina, a rare species in the Queen Charlotte Islands, was found only in the highly nitrified nesting grounds of sea birds on a small rocky islet in Skincuttle Inlet off the southeast coast of Moresby Island. The few records from

Alaska and Yukon are obvious introductions, but it occurs in native habitats in the central part of British Columbia to at least 55°N.

499. Veronica scutellata L., Sp. Pl. 1: 12. 1753.

GRAHAM ISLAND: about 2½ mi S of Tlell, *CST23408*, *CT35944*, *CT36879*.

MORESBY ISLAND: 6 mi S of Sandspit, *CST21948;* Red Mud Marsh, *CST23193*, *CT35364*.

Veronica scutellata is of local occurrence in the Queen Charlotte Islands. On Graham Island it was found only in a gravel pit near Tlell and on Moresby Island was collected in roadside marshes and in a bog a few miles south of Sandspit. It is surprising there are so few records for this species as there are many suitable habitats for it in the lowlands along the east coast. All collections belong to the glabrous phase of the species.

500. *Veronica serpyllifolia L., Sp. Pl. 1: 12. 1753.

GRAHAM ISLAND: Haida Pt., *CST20870;* Tow Hill, *CST21179;* Jungle Beach, *CST21396;* 3½ mi NW of Tlell, *CTS34613;* Image Pt., *CTS34689;* near mouth of Oeanda River, *CT35891;* Honna River, *Pillsbury 360* (UBC).

MORESBY ISLAND: Skidegate Lake, *CST21014;* near Alliford Bay, *CST21055;* near Sandspit, *CST21089* (DAOM); about 2 mi W of Sandspit, *CT35357*.

All collections of *V. serpyllifolia* from the Queen Charlotte Islands belong to the Eurasian ssp. *serpyllifolia*, which is sporadically introduced throughout the lowlands of British Columbia, mainly west of the Coast Mountains. Stems and pedicels of this subspecies are puberulent with appressed curved non-glandular hairs, and the flowers vary from almost white to pale blue with darker blue lines. In contrast, the native lowland to alpine ssp. *humifusa* (Dicks.) Syme (= *V. tenella* All.) of British Columbia and coastal Alaska has pubescent stems and pedicels with spreading, straight or curled glandular hairs, and its flowers are darker blue and usually larger.

This species is a common introduction along roadsides and in disturbed habitats in the settled areas of eastern Graham and northeastern Moresby islands.

501. Veronica wormskjoldii R. &. S., Syst. Veg. 1: 101. 1817.
V. alpina var. *unalaschensis* Cham. & Schlecht., Linnaea 2: 556. 1827.
V. alpina sensu Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 74. 1921.
V. wormskjoldii ssp. *nutans* (Bong.) Pennell, Rhodora 23: 15. 1921.
V. alpina var. *geminiflora* Fernald, Rhodora 41: 454. 1939.
V. alpina var. *alterniflora* Fernald, *op. cit.* 455.
V. alpina var. *cascadensis* Fernald, *op. cit.* 456.

GRAHAM ISLAND: Jalun Lake, *CT35649*.

MORESBY ISLAND: Newcombe Peak, *CST22002;* Takakia Lake, *CST-23049, CT36327;* Mt. de la Touche, *CT23538;* Mosquito Mtn., *CT23739, CT36475;* Mt. Moresby, *CT36405.*

We are following Pennell (1921, p. 15) and Hultén (1949*a*, p. 1380) in treating the wide-ranging, western North American montane element of the *V. alpina* complex as a distinct species *V. wormskjoldii.* It is both morphologically distinct and geographically isolated from *V. alpina* of subarctic northeastern North America and Eurasia. Fernald (1939) considered the North American population to belong to a single species *V. alpina* in which he recognized four distinct races in the Cordilleran region: var. *unalaschensis* Cham. & Schlecht., var. *geminiflora* Fernald, var. *alterniflora* Fernald, and var. *cascadensis* Fernald. He reported all four varieties from British Columbia, but there seems to be no justification for their recognition after examination of well over 100 collections from Alaska, Yukon and British Columbia in the herbarium of this institute. Both Pennell and Hultén considered that typical *V. wormskjoldii* is essentially a a plant of the interior mountain ranges. In the coastal belt of Alaska they recognized another race, ssp. *nutans*, which is characterized by broader, rounder, more toothed leaves, and larger corollas. Plants from coastal Alaska and British Columbia usually possess the morphological characters attributed to ssp. *nutans*, but these same characters are found in some plants that occur as far east as the Rocky Mountains. We fully agree with Hultén that the differences between the two races are not well marked. Until someone undertakes a comprehensive study of the taxa included in the *V. alpina* complex, we feel that this weak coastal ecotype should not be recognized.

In the Queen Charlotte Islands *V. wormskjoldii* is restricted to rocky exposures in the subalpine and alpine zones. Seven of the eight records are from the main mountain mass of the Queen Charlotte Ranges between Mount Moresby and Mount de la Touche. The disjunct station near Jalun Lake in the northern section of Graham Island is at the northern limit of the mountain system.

This species was reported by Carter and Newcombe (1921, p. 74) from the Charlottes but with no exact locality. This report presumably was based on a collection by Dr. C. F. Newcombe, but no material of this species was found in his collections, which were recently acquired by the British Columbia Provincial Museum in Victoria.

Lentibulariaceae

Plants terrestrial; leaves entire; corollas violet	*Pinguicula*
Plants aquatic; leaves dissected; corollas yellow	*Utricularia*

Pinguicula

Scapes glandular-puberulent, but not villous on lower half; flowers deep purple, 15-35 mm long	*P. vulgaris*
Scapes glandular-puberulent, villous on lower half; flowers mauve, 5-8 mm long	*P. villosa*

502. Pinguicula villosa L., Sp. Pl. 1: 17. 1753.

GRAHAM ISLAND: about 7 mi S of Masset, *CST21254;* near Tow Hill, *CST21331;* about 8 mi SE of Port Clements, *CST21348;* about 10 mi SSE of Juskatla, *T1;* 3½ mi NW of Tlell, *CST34610;* 7 and 10 mi N of Port Clements, *CTS34707, CTS34712;* White Creek Muskeg, *CTS34749.*

This species is characterized by its diminutive habit and small basal rosette of leaves that are usually embedded in sphagnum. Plants characteristically have a single flowering scape with small, but showy flowers. The corolla soon abscisses, leaving a bare inconspicuous scape protruding only a few centimeters above the sphagnum. The plants are usually restricted to a microhabitat limited to the slopes of small hummocks. The habit, morphological characters and absence of any large concentrated populations make this a difficult plant to find in the field.

Pinguicula villosa was only found in the extensive lowland sphagnum bogs in the northeastern section of Graham Island. The somewhat disjunct Juskatla collection is from a small, raised, well-developed sphagnum bog in an opening in the coniferous forest.

Although *P. villosa* is widespread in Alaska and northern Canada, only a single locality, other than the Queen Charlotte Island records, is known for British Columbia. Raup (1947) records a station for this species on Vancouver Island.

503. Pinguicula vulgaris L. ssp. **macroceras** (Link) Calder & Taylor, Can. J. Bot. 43: 1399. 1965.

P. macroceras Link, Jahrb. Gewächs. 1: 54. 1820.

P. vulgaris var. *macroceras* (Link.) Herder, Acta Hort. Petrop. 1: 380. 1873.

GRAHAM ISLAND: near Tow Hill, *CST21156, CST21330;* 8 and 6½ mi SE of Port Clements, *CST21353, CTS34617;* Empire Anchorage, *CS21457;* McClinton Bay, *CST21631;* Langara Island, *CST22528;* between Ells and Mercer pts., *CST22923;* Newton Pt., *CST22953;* Shields Bay, *CT23304;* White Creek Muskeg, *CTS34741;* Dawson Inlet, *CTS35093;* Jalun Lake, *CT35625;* Masset, Sept. 25, 1912, *Green* (UBC); Tlell, May 27, 1951, *Cowan* (UBC).

MORESBY ISLAND: Chaatl Narrows, *CST21750;* Newcombe Peak, *CST22014;* Bigsby Inlet, *CST22122, CST34885;* Takakia Lake, *CST23073;* Mt. de la Touche, *CT23541;* Upper Victoria Lake, *CT35796;* Kootenay Inlet, *CT36170;* Mt. Moresby, Aug. 1961, *Foster & Bigg* (UBC).

The Pacific northwest race of *P. vulgaris* L. has been variously treated by authors. In the two most recent monographs of the genus it has been treated as *P. vulgaris* by Ernst (1961) and as a distinct species, *P. macroceras*, by Casper (1962). *Pinguicula vulgaris s. str.* is restricted to Europe, eastern North America and the boreal regions of northern Canada and Alaska. The northern Pacific race, which we are retaining as *P. vulgaris* ssp. *macroceras*, extends from northern

California northwards along the coast to the Aleutian Islands and reaches Japan and Kamchatka. In southern British Columbia it extends inland to the Rocky Mountains but in the northern portion of the province this subspecies is essentially coastal, a few populations extending inland along the Skeena River drainage system. A single collection is known from the southwest corner of Yukon. In Alaska ssp. *macroceras* is restricted to the Pacific slope whereas ssp. *vulgaris* occurs inland to the Bering Sea. The most useful diagnostic characters for distinguishing the two subspecies are the aspect of the corolla and form of the corolla lobes as described by Casper (*op. cit.*, p. 213, 215).

All populations observed on the Queen Charlotte Islands flowered abundantly and many fruiting specimens were seen in the latter part of the season. The flowering specimens commonly possess smutted anthers. On the west coast, near Empire Anchorage, approximately 75 percent of the plants were infected with smut. Subspecies *macroceras* occurs predominantly in boggy habitats and ranges from sea level to well above tree line. It was particularly abundant in the extensive sphagnum bogs of northeastern Graham Island.

Utricularia

Bladder-bearing branches leafless; leaves quasipalmate, usually 3-parted at the base; leaf segments flat, serrate, the midvein often conspicuous ..... *U. intermedia*

Bladder-bearing branches leafy; leaves quasipalmate or quasipinnate; ultimate leaf segments flat, terete or capillary, the midvein never conspicuous

- Leaves quasipalmate, usually 3-parted at the base; leaf segments flat, entire ..... *U. minor*
- Leaves quasipinnate, usually 2-parted at the base; ultimate segments terete or capillary, conspicuously serrate ..... *U. vulgaris*

504. Utricularia intermedia Hayne in Schrader, J. fûr die Bot. 1: 18. 1800.

GRAHAM ISLAND: between Tow Hill and Rose Spit, *CST21222;* Empire Anchorage, *CS21533;* Marie Lake, *T100;* Jalun Lake, *CT35622;* Yakoun Lake, *CT36799.*

MORESBY ISLAND: Upper Victoria Lake, *CT35740.*

Utricularia intermedia is found in mucky-bottomed pools and ponds in the lowland bogs and larger clear-water lakes. It is probably much more widely distributed in the Queen Charlotte Islands than indicated by the few scattered records. It is either an aquatic, free-floating species like *U. minor* L. and *U. vulgaris* L. or is found creeping along the bottoms of shallow pools with its bladder-bearing branches embedded in the bottom ooze. It also occurs in terrestrial habitats, such as exposed muddy shorelines, which are subject to frequent

flooding or constant seepage from springs. Only a few flowering colonies were noted.

505. Utricularia minor L., Sp. Pl. 1:18. 1753.

GRAHAM ISLAND: between Tow Hill and Rose Spit, *CST21223;* Tan Mtn., *CST21625;* Newton Pt., *CST22946;* about 9 mi S of Juskatla ,*T78.*

MORESBY ISLAND: Red Mud Marsh, *CST22061, CT35373, CT36728;* Upper Victoria Lake, *CT35772.*

Utricularia minor is common in many ponds, pools and rivulets on open boggy slopes in the mountain ranges and in lowland muskegs on the Queen Charlotte Islands. This diminutive species is often overlooked because its inconspicuous threadlike stems are usually partially hidden in muddy ooze. No flowering specimens were noted on the Islands.

506. Utricularia vulgaris L., Sp. Pl. 1: 18. 1753.

GRAHAM ISLAND: between Tow Hill and Rose Spit, *CST21221;* about 9 mi SSE of Juskatla, *T79;* Jalun Lake, *CT35621.*

MORESBY ISLAND: White Swan Bog, *CST21036;* Red Mud Marsh, *CST22062;* Skidegate Lake, *CT23419;* Upper Victoria Lake, *CT35797.*

The spurs of the flowers of North American *U. vulgaris* tend to be more slender and more pointed than those of European plants; however, we have not seen enough flowering material from Europe to judge whether these differences are consistent.

Utricularia vulgaris is common in many of the mucky-bottomed pools in the lowland sphagnum bogs of Graham and Moresby islands. It is probably present throughout the Charlottes.

Plantaginaceae

Plantago

Corolla tube hairy; leaves linear or nearly so..... *P. maritima*
Corolla tube glabrous; leaves lanceolate to broadly ovate or cordate
  Leaves broadly ovate or cordate, always distinctly petiolate; plants not woolly or fibrous at the base.... *P. major*
  Leaves lanceolate; plants woolly or fibrous at the base
    Scapes always much longer than the leaves, not conspicuously woolly pubescent in upper 5 cm; caudex short and often woolly pubescent at crown.. *P. lanceolata*

Scapes as long as or only slightly longer than the leaves, conspicuously woolly pubescent in upper 5 cm; caudex long and very robust, often fibrous at the crown but never woolly ..... *P. macrocarpa*

507. *Plantago lanceolata L., Sp. Pl. 1: 113. 1753.

GRAHAM ISLAND: Masset Spit, *CST22639*, *CTS34733;* Tlell, *CST-23152;* Queen Charlotte City, *CT35843.*

MORESBY ISLAND: Sandspit, *CT35158.*

A common species of disturbed ground and open habitats near settlements in eastern Graham and northeastern Moresby islands.

508. Plantago macrocarpa Cham. & Schlecht., Linnaea 1: 166. 1826.

GRAHAM ISLAND: Tlell, *CST21361;* Yakoun River Delta, *CST21551*, *CT35463;* Kumdis Creek Delta, *CST22110A*, *CT36128;* Dawson Inlet, *CTS-35132A;* Naden Harbour, *CT36856*, Masset, July 1914, *Green* (UBC).

MORESBY ISLAND: Skidegate Lake, *CT35266;* Upper Victoria Lake, *CT35745;* head of Cumshewa Inlet, *CT36248;* Tasu, June 1901, *Newcombe* (V).

Plantago macrocarpa is a distinctive coastal plantain which ranges in North America from northern Oregon to the Aleutian Islands. It is widely distributed throughout the Charlottes, but is only common in extensive saline or brackish meadows such as those of the Yakoun River and Kumdis Creek deltas in Masset Inlet. Although it usually occurs in saline meadows, it is not an obligate halophyte for it occasionally grows along the gravelly or rocky shorelines of freshwater lakes, e.g., Skidegate and Upper Victoria lakes.

509. Plantago major L., Sp. Pl. 1: 112. 1753.

GRAHAM ISLAND: Tow Hill, *CST22681;* 2½ mi S of Tlell, *CST23405*, *CTS34662;* 2 mi NW of Tlell, *CT35690;* Tlell, *CT35941.*

MORESBY ISLAND: Alliford Bay, *CT36482;* Gowdas Islands, *CT36573.*

We have been unable to distinguish introduced from indigenous plants of *P. major* but it seems likely that the Tow Hill and Gowdas Island populations are of native origin. This species is widely distributed but of local occurrence throughout the Islands.

510. Plantago maritima L., Sp. Pl. 1: 114. 1753.

GRAHAM ISLAND: McClinton Bay, *CST21668;* between Skidegate and Skidegate Village, *CST21712*, *CTS34670;* west of Queen Charlotte City,

CST22475; Langara Island, *CST22537*, June 13, 1956, *Widdowson* (UBC); Yakan Pt., *CST22724;* Masset Spit, *CST22784* (DAOM); Dawson Inlet, *CST22865*, *CTS35142;* Tlell, *CST23178*, *CTS34632;* Torrens Island, *CT35828;* Long Inlet, *CT36008;* Naden Harbour, *CT36866*.

MORESBY ISLAND: Copper Bay, *CST21900;* head of Cumshewa Inlet, *CST21981*, *CT23649* (DAOM); islet off Bolkus Islands, *CST22241;* Hotspring Island, *CST22278;* Kootenay Inlet, *CT36197;* Sunday Inlet, *CT36599;* Tasu, June 1901, *Newcombe* (V); Gawi, June 1901, *Newcombe* (V); Louscoone Inlet, Sept. 13, 1951, *Pillsbury* (UBC).

Plantago maritima, a worldwide maritime species mainly of the northern hemisphere, has been the subject of a number of taxonomic treatments. It has been segregated into a number of geographical races that are poorly defined and extremely difficult to determine. Hence we are unwilling to assign any infraspecific designation to plants from the Queen Charlotte Islands, but prefer to recognize them as *P. maritima* in the broad sense.

This species is found in all saline habitats along the coast of the Queen Charlotte Islands. It is extremely salt tolerant as it is one of the few species that grows on exposed rocky shorelines and headlands that are continuously subjected to ocean spray and high tides. It frequently occurs short distances back from the shoreline on top of and in soil-filled niches of rock bluffs.

Rubiaceae

Corollas pink or lilac; calyx of 4-6 distinct sepals, persistent in fruit; fruit not borne on elongated pedicels or peduncles ..... *Sherardia*

Corollas white, occasionally pink; calyx an inconspicuous minute annular ridge; fruit borne on elongated peduncles or pedicels ..... *Galium*

Galium

Leaves blunt or rounded at the tip; fruit glabrous ..... *G. trifidum*

Leaves cuspidate or mucronate at the tip; fruit bristly or hairy

- Principal stem leaves in 2-4 whorls of 4; leaves broadly ovate, thin, 3-nerved; inflorescence terminal ..... *G. kamtschaticum*
- Principal stem leaves in 6-10 whorls of 6 to 8; leaves narrowly lanceolate, oblanceolate or elliptic, 1-nerved; inflorescences axillary and terminal
  - Leaves in whorls of 8, narrowly lanceolate or oblanceolate; stems and leaves strongly retrorse-hispid ..... *G. aparine*
  - Leaves in whorls of 6, elliptic; stems and leaves weakly retrorse-hispid ..... *G. triflorum*

511. Galium aparine L., Sp. Pl. 108. 1753.

GRAHAM ISLAND: near Queen Charlotte City, *CST22467;* Langara Island, *CST22573;* Masset Spit, *CST22630;* Tow Hill, *CST22686;* Tlell, *CST23251;* Image Pt., *CTS34690;* 2½ mi S of Jungle Beach, *CT36700;* Naden Harbour, *CT36842;* Skidegate, May 30–31, 1923 and June 1901, *Newcombe* (V), July 29, 1910, *Spreadborough* (CAN); Dawson Harbour, June 24, 1897, *Newcombe* (CAN); Sisk, June 4, 1913, *Newcombe* (V).

MORESBY ISLAND: between Alliford Bay and Sandspit, *CST23239, CST23240* (DAOM); Sandspit, *Foster & Joslin 70* (UBC); Little Goose Bay, Sept. 10, 1951, *Pillsbury* (UBC); Skedans, April 1901, *Newcombe* (V).

Galium aparine is a uniform species along the Pacific coast, where it is both native and introduced. It is a particularily common element of the upper parts of shingle beaches in the stabilized driftwood zone All collections from the Islands were made at or near the coast. A few plants were noted along the road at the south end of Mayer Lake, however, these plants were undoubtedly introduced at this station with sand fill brought in from the Tlell area.

512. Galium kamtschaticum Steller ex. R. & S., Syst. Veg. Mant. 3: 186. 1827.

GRAHAM ISLAND: McClinton Bay, *CST21654;* Blackwater Creek, *T50, S3530;* Marie Lake, *T85;* 8 mi SSW of Juskatla, *CT35475.*

MORESBY ISLAND: Bigsby Inlet, *CTS34883;* between Cumshewa and Peel inlets, *CT35216;* Mt. Moresby, *CT35325;* Takakia Lake, *CT36291;* Sunday Inlet, *CT36604.*

This distinctive *Galium* occurs sporadically along the northwest coast of North America and in Kamchatka and Korea. It represents one of our rarest species in the Cordilleran region. On the Queen Charlotte Islands, *G. kamschaticum* occurs only in the rather open mature coniferous woods bordering creeks and on open, grassy, stabilized subalpine talus slopes. Its best development is on well-drained but rich sandy alluvial soils, where it is frequently associated with *Polystichum braunii* (Spenner) Fée and *Circaea alpina* L. Most populations observed showed well-developed vegetative reproduction but only a few plants in any one colony produced flowers or fruit. Its distribution on the Islands is apparently restricted to the mountains and their adjacent flanks.

513. Galium trifidum L., Sp. Pl. 1:105. 1753.

G. brandegei A. Gray, Proc. Amer. Acad. 12: 58. 1876.
G. trifidum var. *pacificum* Wieg., Bull. Torrey Club 24: 400. 1897.
G. trifidum var. *subbiflorum* Wieg., *l.c.*
G. columbianum Rydb., Fl. Rocky Mts. 808. 1917; *G. trifidum* ssp. *columbianum* (Rydb.) Hult., Fl. Aleut. Is. 307. 1937.

GRAHAM ISLAND: McClinton Bay, *CST21638;* 3 mi NW of Tlell, *CST22067;* Tow Hill, *CST22680;* Dawson Inlet, *CST22855;* Tlell, *CST23168;* Honna River, *CT35406;* Lawn Pt., *CT35447;* Delkatla Inlet, *CT35586;* about 4 mi N of mouth of Oeanda River, *CT35868;* Naden Harbour, *CT36841.*

MORESBY ISLAND: White Swan Bog, *CST21939;* head of Cumshewa Inlet, *CST21976;* Bag Harbour, *CST22186A;* Harriet Harbour, *CST22270;* Hotspring Island, *CST22301;* Red Mud Marsh, *CST23197; CT35368;* mouth of Deena River, *CT23782;* Kootenay Inlet, *CT36210;* Yakulanas Bay, *CT36653.*

The *G. trifidum* complex in North America is in need of a careful systematic study. Much of the present confusion regarding the many taxa described in this complex dates to the inadequate and confusing study by Wiegand (1897). Since his study no attempt has been made to critically evaluate the taxa in this complex. Gleason (1952*c*) recognizes four species, i.e., *G. obtusum* Bigel., *G. labradoricum* Wieg., *G. tinctorium* L., and *G. brandegei* A. Gray. The relationship of the European and North American species *G. palustre* L. to *G. trifidum* is not discussed, but this species must be considered when the complex is studied. Fernald (1950, p. 1324) includes an additional species in this complex, *G. brevipes* Fern. & Wieg., but states it may be a segregate of *G. brandegei.* In addition to the eastern species, three western infraspecific taxa, *pacificum* Wieg., *subbiflorum* Wieg., and *columbianum* (Rydb.) Hult., have been proposed within *G. trifidum;* and two more, *submontanum* Wright and *diversifolium* Wright, are described for *G. tinctorium.*

We have examined a series of specimens (*ca.* 250) of the *G. trifidum* complex, excluding *G. palustre. Galium trifidum* is an extremely variable species with respect to degree of pubescence, stature, leaf type and number, and characters associated with the inflorescence and flower. The high degree of overlap in geographical area outlined by previous authors for the supposedly distinct western taxa is not consistent with known geographical ranges of other well-recognized species from the same regions. As we were unable to segregate this species on the basis of morphology and realistic geographical ranges, we are including all western material in *G. trifidum.*

This species shows a fairly wide range of ecological tolerance on the Islands. It occurs occasionally around the edge of sphagnum bog pools, commonly along the upper portions of sea beaches in the driftwood zone, occasionally on rock outcrops along beaches, in grass and sedge meadows, along river banks, and one collection was made along the margin of an alkaline pond. Although plants grow in quite different habitats, the population from the Islands is remarkably uniform. Other western Canadian, Alaskan and American material closely matches that from the Charlottes and clearly this entire population must be considered as a single species, as Cronquist (*in* Hitchcock *et al.*, 1959, p. 452) has done in a recent Pacific northwest flora. However, we seriously question the validity of his segregation of three varieties within the species as we were unable to key these entities with any appreciable degree of accuracy.

514. Galium triflorum Michx., Fl. Bor.-Amer. 1: 80. 1803.

GRAHAM ISLAND: McClinton Bay, *CST21655;* near Skidegate Village, *CST21714;* 3 mi NW of Tlell, *CST22070;* Langara Island, *CST22577*, June 1, 1952, *Guiget* (V); Lepas Bay, *CST22602;* Mamin River Delta, *T132;* 4½ mi S of Port Clements, *CT35561;* Mamin River, June 17, 1952, *Schmidt*, Yakoun River, June 13, 1952, *Schmidt;* Queen Charlotte City, July 7, 1952, *Schmidt;* Skidegate, June 1, 1914, *Green* (UBC), July 10, 1910, *Spreadborough* (CAN), May 30, 1928, *Newcombe* (V).

MORESBY ISLAND: Copper Bay, *CST20977*, *CST21930*, *Foster & Joslin 14* (UBC); Alliford Bay, *CST21856;* 3 mi E of Skidegate Lake, *CST21913;* Jedway, *CST22271;* Echo Harbour, *CST22332;* mouth of Deena River, *CT23783;* Dass Pt., *CTS35022;* between Cumshewa and Peel inlets, *CT35219;* Kaisun, *CT36564*, July 1897, *Newcombe* (V); Lockeport, June 1, 1923, *Newcombe* (V).

Galium triflorum is a remarkably uniform and widely distributed circumboreal species. One variety, *asprelliforme*, was described by Fernald from the southeastern United States but most authors have ignored this tenuous segregate.

Galium triflorum is widely distributed and common throughout the Queen Charlotte Islands in a variety of habitats. It was collected along creek banks in dense coniferous forest, on grassy benches and rocky cliffs at the shoreline, among driftwood along the upper part of sea beaches, in logged-over forest, and in open alder woods on river flats.

Sherardia

515. *Sherardia arvensis L., Sp. Pl. 1: 102. 1753.

GRAHAM ISLAND: Queen Charlotte City, *CT36941.*

MORESBY ISLAND: Sandspit, *CT35328.*

A weedy Mediterranean species that has been introduced in dry coastal areas of Vancouver Island and adjacent mainland of British Columbia. It occurs on the Queen Charlotte Islands in similar habitats at the eastern end of Skidegate Inlet. The records from the Islands represent the most northerly stations along the Pacific coast.

Caprifoliaceae

Plants herbaceous, stems trailing or creeping . . . . . *Linnaea*
Plants woody, upright shrubs or climbing vines
  Leaves compound . . . . . *Sambucus*
  Leaves simple
    Leaf margins serrate; fruit a 1-seeded drupe . . . . . *Viburnum*
    Leaf margins entire or irregularly lobed; fruit a berry

Corollas yellow or pale cream, tinged with purple; leaf margins entire ..... *Lonicera*
Corollas pink or rose-tinged; leaf margins often irregularly lobed ..... *Symphoricarpos*

Linnaea

516. Linnaea borealis L. ssp. **longiflora** Hult., Fl. Aleut. Is. 310. 1937.
L. americana Forbes, Hort. Woburn. 135. 1833; *L. borealis* var. *americana* (Forbes) Rehder, Rhodora 6: 56. 1904; *L. borealis* ssp. *americana* (Forbes) Hult., Fl. Aleut. Is. 310. 1937.

GRAHAM ISLAND: Langara Island, *CST22584;* near Tow Hill, CST22697; Newton Pt., *CST22964A;* Image Pt., *CST23255;* 3 mi NW of Tlell, CST*23489;* near Marie Lake, *T84;* 15 mi S of Masset, *CT35569;* Juskatla, June 7, 1952, *Schmidt;* Tlell, June 1951, *Cowan* (UBC); Masset, Sept. 25, 1912, *Green* (UBC); Yakoun Lake, Aug. 1895, *Newcombe* (V); Skidegate, July 1895 and June 1897, *Newcombe* (V).

MORESBY ISLAND: head of Cumshewa Inlet, *CST22046;* Echo Harbour, *CST22335;* Braverman Creek, *CT35225;* Mt. Moresby, July 13, 1961, *Foster & Bigg* (UBC).

The recognition of the North American *Linnaea borealis* as the subspecific segregate *longiflora* has been fully discussed by Cronquist (*in* Hitchcock *et al.*, 1959, p. 455) and accepted by Gleason (1952c, p. 304). Some of the collections which Hultén cites from central and southern Alaska under ssp. *americana* may represent intermediate forms between the essentially Eurasian ssp. *borealis* and ssp. *longiflora*. These plants have the leaf form of the typical phase and the flower type of *longiflora*. All Pacific coast plants from the Alaskan panhandle south belong to the wide-ranging North American ssp. *longiflora*.

Linnaea borealis is a common and widespread ground cover throughout most of Islands. It occurs in such diversified habitats as logged-over forests, drier areas of sphagnum bogs, rocky slopes along the coast and margins of brooks in subalpine habitats.

Lonicera

Flowers paired on axillary peduncles; involucres prominent, dark red; petals yellow ..... *L. involucrata*
Flowers many in large tightly compact terminal inflorescences; involucres inconspicuous; petals pale cream, often tinged with purple ..... *L. etrusca*

517. *Lonicera etrusca Santi, Viagg. Mont. 113. 1795.

GRAHAM ISLAND: Port Clements, *CT36115;* 2½ mi S of Jungle Beach, *CT36678.*

MORESBY ISLAND: East Copper Island, *CST22212;* Rose Harbour, *Foster & Joslin 86* (DAO, UBC).

Lonicera etrusca is a native of the Mediterranean region that has been introduced in a few places on the Queen Charlotte Islands as an ornamental vine. It has large, showy, globular heads of long-petaled cream flowers tinged with purple. This species should probably be grown more widely as a garden and trellis plant.

518. Lonicera involucrata (Rich.) Banks ex Sprengel, Syst. Veg. 1: 759. 1825.

GRAHAM ISLAND: near Lawnhill, *CST20899;* Tow Hill, *CST21178;* Masset Spit, *CST21235;* between Skidegate and Skidegate Village, *CST21431, CST21710, CT35838;* Langara Island, *CST22561,* June 13, 1956, *Widdowson* (UBC); Tlell area, *CTS35077, CT35434,* Sept. 2, 1943, *Beitush* (V); Image Pt., *CT35381;* Queen Charlotte City to Skidegate, June 1, 1951, *Cowan* (UBC); Dawson Harbour, June 29, 1897, *Newcombe* (CAN, V); Skidegate, Sept. 1902, *Newcombe* (V); Masset, 1929, *Young* (V).

MORESBY ISLAND: Sandspit, *CST21088,* May 1901, *Newcombe* (V); Bag Harbour, *CST22182;* inlet between Harriet Harbour and Huston Inlet, *CST22246;* Tuft Islets, *CTS34871;* Louscoone Inlet, Sept. 13, 1951, *Pillsbury* (UBC).

This species is a conspicuous element of the lowland coastal vegetation throughout the Queen Charlotte Islands. It is usually a large robust shrub that occasionally reaches a height of 5 m, but on the mainland east of the Coast Mountains shrubs are smaller and usually less than 2 m high.

Sambucus

519. Sambucus racemosa L. ssp. **pubens** (Michx.) House, Woody Pl. West. N.C. 32. 1913.
S. callicarpa Greene, Fl. Fran. 342. 1892.

GRAHAM ISLAND: Lawnhill, *CST20898;* Queen Charlotte City, *CST20909B, CST23014* (DAOM); Tow Hill, *CST21194;* Masset, *CST21287* (DAOM); Empire Anchorage, *CS21505;* Skidegate, *CST22451,* June 1897 and May 21, 1901, *Newcombe* (V); Langara Island, *CST22544;* Juskatla, *T21;* Dawson Inlet, *CTS32122;* between Millar Creek and Skidegate Village, *CT36692;* mouth of Kliki Creek, *CT36822;* Dawson Harbour, June 24, 1897, *Newcombe* (CAN).

MORESBY ISLAND: Skidegate Lake, *CST21007;* Alliford Bay, *CST21068;* East Copper Island; *CST22215;* Mt. de la Touche, *CT23557;* Gray Bay, *CT35246;* 2 mi W of Skidegate Lake, *CT36702;* Church Creek, *Pillsbury 305* (DAO, UBC).

The widely distributed North American red-fruited elderberry has been treated by many authors as a distinct species *S. pubens* or as a segregate of the Old World *S. racemosa*. We agree with Hultén (1949, p. 1442) that *S. pubens* should be considered as a race of the Eurasian *S. racemosa*, but we are unable to fully evaluate the four varieties recognized by Cronquist (*in* Hitchcock *et al.*, 1959, p. 463) under ssp. *pubens* as we have not seen sufficient fruiting material. The presence of bright-red fruit and smooth nutlets would place the collections from the Queen Charlotte Islands in var. *arborescens* (T. & G.) A. Gray.

Sambucus is widely distributed on the Islands and it is usually found growing in the openings or along the margins of forests and creeks. It is particularly abundant in some logged-over areas. Several collections were made on exposed rocky bluffs along the coast.

Dr. C. F. Newcombe noted on his 1901 collection from Skidegate that the Haidas ate the berries of *Sambucus* and used the stems for arrow tips.

Symphoricarpos

520. Symphoricarpos albus (L.) Blake, Rhodora 16: 118. 1914.

S. racemosus Michx., Fl. Bor.-Amer. 1: 107. 1803.

S. racemosus var. *pauciflorus* Robbins, Gray's Man. ed. 5. 203. 1867; *S. albus* var. *pauciflorus* (Robbins) Blake, Rhodora 16: 119. 1914.

S. racemosus var. *laevigata* Fernald, Rhodora 7: 167. 1905; *S. albus* var. *laevigatus* (Fernald) Blake, *l.c.*

S. rivularis Suksd., Werdenda 1: 41. 1927.

GRAHAM ISLAND: between Queen Charlotte City and Skidegate Village, *CST21410* (DAOM), *CST21425* (DAOM), *CST23454* (DAOM), *CTS34686*, *CT36685*, June 1, 1951, *Cowan* (UBC); west of Queen Charlotte City, *CST22468;* Queen Charlotte City, *CST23002;* Lina Narrows, July 11, 1952, *Schmidt.*

MORESBY ISLAND: head of Cumshewa Inlet, *CST21963;* East Copper Island, *CST22214;* Limestone Island, *CST22403*, *CTS34824;* Sandspit, *CST23209*, *CT35351;* Gray Bay, *CST23431;* Cumshewa, June 1901 and Sept. 16, 1902 *Newcombe* (V).

The plants from the Queen Charlotte Islands are quite representative of the widely distributed *S. albus*, which extends eastward to Quebec and south to Colorado. The west coast material has been segregated from the wide-ranging typical phase as var. *laevigatus* (Cronquist *in* Hitchcock *et al.*, 1959) or *S. rivularis* (Jones, 1940). However, the diagnostic characters, i.e., pubescence of twigs and leaves, size of fruits, and height of shrubs, are unreliable for distinguishing the segregates when a large series of specimens from different geographical regions are carefully examined and compared. As a result, we recognize a single wide-ranging variable species, *S. albus* (L.) Blake.

Symphoricarpos, a coastal species on the Islands, occurs on rocky bluffs and along the upper part of shingle beaches. Some shrubs attain a height of 1 m and are bushy in habit. Flowers are usually a bright, showy pink.

Viburnum

521. Viburnum edule (Michx.) Raf., Med. Repos. II. 5: 354. 1808.

GRAHAM ISLAND: near Skidegate, *CST21697;* Blackwater Creek, *T35;* Yakoun Lake, *CT36784.*

MORESBY ISLAND: Skidegate Lake, *CST21011*, between Gray and Sheldens bays, *CST23446;* Mt. Moresby, *CT36486.*

Viburnum edule, a common woodland species of the British Columbia mainland, is especially abundant east of the Coast Mountains. It does not appear to be well-adapted to the available habitats in the Queen Charlotte Islands as all plants seen showed abnormal leader development, sparse flowering, and poor fruit set. It is apparently restricted to semiopen, wooded margins of lakes and creeks, and will not tolerate the dense, shady conditions of the closed coniferous forest. This species is of sporadic occurrence and was collected at only six localities during the summers of 1957 and 1964.

The characteristic odor of this species permits its ready detection in the field.

Valerianaceae

Plants annual; basal leaves entire, oblong to obovate; coastal ..... *Plectritis*
Plants perennial; basal leaves deeply lobed or compound, coarsely toothed; alpine or subalpine..... *Valeriana*

Plectritis

522. Plectritis congesta (Lindl.) DC., Prodr. 4: 631. 1830.
Valerianella congesta Lindl., Bot. Reg. 13. *pl.* 1094. 1827.
P. samolifolia (DC.) Hoeck, Bot. Jahrb. 3: 37. 1882; *V. samolifolia* (DC.) A. Gray, Proc. Amer. Acad. 19: 83, 1883.
V. anomala A. Gray, *l.c.*; *P. anomala* Suksd., Deuts. Bot. Monats. 15: 144. 1897.

GRAHAM ISLAND: Haida Pt., *CST20866;* between Skidegate and Skidegate Village, *CST21414*, *CTS34666;* Image Pt., *CTS34677;* Skidegate, June 1, 1914, *Green* (UBC), May 24, 1923, *Newcombe* (V); Skidegate Inlet, July 4, 1897, *Newcombe* (CAN).

MORESBY ISLAND: near Alliford Bay, *CST21052; CST21828;* head of Cumshewa Inlet; *CST21975;* islet off Bolkus Islands, *CST22237;* South Low Island, *CTS34838;* Tuft Islets, *CTS34868;* Low Island, *CTS35014;* Kaisun, *CT36559;* Gowgaia Bay, June 1901, *Newcombe* (V).

In a monograph of *Plectritis*, Nielsen (1949) recorded three species for Vancouver Island: *P. congesta*, *P. anomala*, and *P. samolifolia*. She considered that they belonged to a group of five closely related species, which she referred

to as the "congesta" series. In addition, for each of the three species that occur on Vancouver Island she recognized a variety based on the presence or absence of wings on the seeds. We have examined seed types and flowers of a large number of specimens belonging to this series from British Columbia and have found no apparent correlation between color, size, and shape of corolla; the seeds were found to be small or large, glabrous or pubescent, and winged or wingless.

In a recent biosystematic study of California material, Dempster (1958) recorded three species for the State. The only one relevant to this discussion is *P. congesta*, in which she included *P. anomala* and *P. samolifolia*. She considered the latter entities to represent only extremes in dimorphic floral and fruit morphology and was able to demonstrate this variation in garden studies.

It is unfortunate that no experimental or cytological data is available for the northern populations. This extremely variable genus, particularly members of the "congesta" series, is still in need of a critical biosystematic study to determine relationships within the complex. Consequently, we are tentatively referring all coastal British Columbia collections to *P. congesta*.

Plectritis is essentially confined to dry rocky habitats along the eastern coasts of Moresby Island and the shoreline of Graham Island bordering Skidegate Inlet. Two additional stations are recorded from the west coast. The Kaisun A.I.V. (Ancient Indian Village) locality represents an unusual ecological site on the west coast and its similarity to the dry rocky bluffs found along the eastern end of Skidegate Inlet is striking. It is likely that the present population at this station was initially introduced by the Haidas from the villages along the eastern shores of Skidegate Inlet where the species is abundant.

This species could have been similarly introduced at the Gowgaia station. The records from the Charlottes represent the northern limit for this Pacific coast species.

Valeriana

523. Valeriana sitchensis Bong., Mém. Acad. St. Pétersb. VI. 1: 145. 1832.

GRAHAM ISLAND: Blackwater Creek, *CTS35072;* Long Inlet, *CT35956.*

MORESBY ISLAND: Takakia Lake, *CST23058*, *CT36316*, *Foster & Joslin 61* (UBC); Mt. Moresby, July 13, 1961, *Foster & Bigg* (UBC).

Valeriana sitchensis is represented in the Queen Charlotte Islands by ssp. *sitchensis*. This widely distributed phase occurs throughout British Columbia except in southern Vancouver Island and in the lower Fraser River Valley, where it is replaced by ssp. *scouleri* (Rydb.) F. G. Meyer.

This species occurs occasionally in wet rocky runnels above 1,000 ft on mountain slopes in the Queen Charlotte Ranges. There is a single lowland record, represented by a sterile rosette, from Blackwater Creek a few miles southwest of Juskatla. In addition to the collections cited, this species was noted on the slopes of Mount de la Touche and on Mount Moresby. It is probably more widespread in the mountains than is indicated by the few records.

Campanulaceae

Plants terrestrial with leafy stems; basal leaves lanceolate or oblanceolate; corolla campanulate, blue..... *Campanula*
Plants aquatic or semiaquatic, subscapose; basal leaves linear, fleshy; corolla bilabiate, pale lilac..... *Lobelia*

Campanula

Leaves oblanceolate, conspicuously dentate; calyx pubescent, sepals laciniate..... *C. lasiocarpa*
Leaves lanceolate, entire to crenate; calyx glabrous, sepals entire..... *C. alaskana*

524. Campanula alaskana (A. Gray) Wight ex J. P. Anderson, Proc. Iowa Acad. Sci. 25: 447. 1918. **Figure 177.**

C. rotundifolia var. *alaskana* A. Gray, Syn. Fl. N. Amer. Suppl. 395. 1886.
C. langsdorffiana sensu Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 77. 1921.
C. latisepala Hult., Fl. Alaska & Yukon 9: 1460. 1949.

GRAHAM ISLAND: Tow Hill, *CST21181* (DAOM), *CST22658*, *CTS34757;* Langara Island, *CST22541;* between Ells and Mercer pts., *CST22882;* Newton Pt., *CST22943;* Tlell, *CST22999*, *CT35435;* Yakoun Lake, *CT36743;* Maude Island, July 11, 1952, *Schmidt;* Lina Narrows, July 11, 1952, *Schmidt.*

MORESBY ISLAND: islet off Bolkus Islands, *CST22233;* East Copper Island, *CST22250* (DAOM); Hotspring Island, *CST22297;* Limestone Island, *CST22404;* Sandspit, *CST23212*, *CT36042*, 1901, *Newcombe* (V); Mt. de la Touche, *CT23510*, *CT23615;* Tuft Islets, *CTS34861;* Mosquito Lake, *CT35310;* Mt. Moresby, *CT36384;* Mike Inlet, *CT36664;* Tar Islands, *Foster & Joslin 77* (DAO, UBC); Reef Island, *Foster & Joslin 2* (UBC); Chaatl Island, July 1895 *Newcombe* (V); Kaisun, July 1897, *Newcombe* (V); Gawi, May 30, 1901, *Newcombe* (V); Ninstints, 1901, *Newcombe* (V).

Campanula rotundifolia L. is essentially a polymorphic circumboreal species found throughout the northern half of North America. In the west it extends as far south as Mexico. Many rather indistinct populations have been designated at either the specific or infraspecific level, but all variants have been included as part of *C. rotundifolia s.l.* in a recent conspectus of *Campanula* for North America by Shetler (1963).

We have examined plants from the coastal regions of British Columbia and Alaska and compared them to the interior North American populations. In the northern coastal area of British Columbia and adjacent Alaska, a well-defined entity can be recognized by its large, crenate-margined, broadly ovate and distinctly petioled cauline leaves; reflexed calyx composed of broadly triangular sepals; and large flowers that are up to twice as long and 2 to 3 times as broad as those of the interior entity and are usually produced one per stalk. There is a tendency for reduction in leaf width and an increase in the number of flowers per



Figure 177. *Campanula alaskana* (A. Gray) Wight ex J. P. Anderson, habit (× ½).

stalk as the plant occurs southward along the coast to Vancouver Island. These transitional types represent part of a coastal cline towards *C. rotundifolia* of the interior. The distinct northern coastal population was first recognized as a variety of *C. rotundifolia*, i.e., var. *alaskana* A. Gray; and later as a distinct species *C. alaskana* (A. Gray) Wight or *C. latisepala* Hult. Hultén first recognized this taxon as var. *alaskana* (1937, p. 313) but later (1949*a*, p. 1460) recognized it as a distinct species *C. latisepala*.

On the basis of examination of material in this complex we recognize the northern coastal population and plants from the Queen Charlotte Islands as a distinct species *C. alaskana*. It is unfortunate that Hultén proposed the epithet *latisepala* for this entity for Gray's description of his new variety *alaskana* in 1886 accurately describes the Alaskan coastal plant. In addition to its description, Gray gives the following geographical range: "from the Aleutian Islands to Sitka and Kodiak." This distribution closely parallels that given by Hultén for his new species. As the epithet *alaskana* was raised to specific rank in 1918, this name has priority over *C. latisepala*.

A single collection made just south of Sandspit along the road to Copper Bay possesses very narrow leaves and many flowers stalks with more than one flower per stalk. This collection resembles the interior population but can be distinguished from it on the basis of its large flowers and generally reflexed calyx of long sepals. All the subalpine collections possess the typical leaf characteristics of the Alaska material. *Campanula alaskana* is widely distributed throughout the Islands and is one of the most common coastal elements of Moresby and Graham islands.

525. Campanula lasiocarpa Cham., Linnaea 4: 39. 1829.

MORESBY ISLAND: Mt. de la Touche, *CT23509*.

Campanula lasiocarpa, a fairly widespread alpine species of the Cordilleran region of western North America, extends westward to Kamchatka and Japan through the Aleutian Island chain. The Queen Charlotte Island material differs somewhat from that of the mainland in having very large campanulate flowers (up to 3.5 cm long) and in possessing a large number of cauline leaves that show little reduction in size from those of the poorly developed basal rosettes. In addition, the leaves tend to be more oblanceolate with blunt or rounded tips. The robust habit of *C. lasiocarpa* on the Queen Charlotte Islands may in part be due to the protected sites in which it grows and the prevailing moderate climate along the west coast. We were unable to find this species during our 1964 survey and *C. lasiocarpa* must be considered as one of several rare alpine species on the Islands.

Lobelia

526. Lobelia dortmanna L., Sp., Pl. 1: 929. 1753.

GRAHAM ISLAND: Yakoun Lake, *CT36794*.

MORESBY ISLAND: Skidegate Lake, *CT23624;* Mosquito Lake, *CT23651, CT35307, CT36722.*

The taxonomic disposition of *Lobelia dortmanna* in North America has been recently discussed by Bowden (1959, p. 51). He points out that European plants tend to be robust with coarse scapes and broad, pigmented leaves. In contrast, the North American plants usually have narrow scapes and predominantly green leaves. As these morphological forms are not consistent within any one geographical region and occur in each, it is unrealistic to segregate the North American from the European population.

In 1957, a few plants of *L. dortmanna* were collected in shallow water along the gravel beach at the east end of Skidegate Lake and another colony was located in a similar habitat at Mosquito Lake. It was well established at the latter station, but both colonies were comprised largely of sterile rosettes. In 1964 an extensive flowering colony was located near the mouth of Baddeck Creek on the east side of Yakoun Lake and additional colonies were found at the two localities reported in 1957. As far as we are aware, these stations represent the northernmost records for this species along the Pacific coast. The nearest station to the south is at East Drum Lake (*Calder & MacKay 31733*) on Vancouver Island.

Compositae

Flower heads with conspicuous ray flowers

Plants scapose

Plants fibrous-rooted

Rays white, often tinged pink; heads radiate .... *Bellis*

Rays yellow; heads ligulate ..... *Leontodon*

Plants tap- or tuberous-rooted

Leaves narrowly lanceolate, entire; tuberous-rooted ..... *Apargidium*

Leaves oblanceolate, runcinate-pinnatifid; tap-rooted ..... *Taraxacum*

Plants with leafy flowering stems

Cauline leaves opposite ..... *Arnica*

Cauline leaves alternate

Leaves simple, margins entire, serrate, pinnately-lobed or -toothed

Rays mauve or purple

Involucral bracts narrowly lanceolate, without chartaceous margins at base ..... *Erigeron*

Involucral bracts broadly lanceolate with pale chartaceous margins at base ..... *Aster*

Rays not mauve or purple

Leaves with entire, serrate or dentate margins, never lobed

Leaves triangular or sagittate
Leaves triangular, regularly serrate; heads radiate ..... *Senecio*
Leaves sagittate, irregularly dentate; heads ligulate ..... *Prenanthes*
Leaves not triangular or sagittate
Plants subscapose with a basal rosette of leaves
Involucres black or green; heads ligulate *Hieracium*
Involucres purple; heads radiate ..... *Erigeron*
Plants never subscapose, lacking a conspicuous basal rosette of leaves
Heads less than 1 cm in diameter; inflorescence of many congested heads, paniculiform ..... *Solidago*
Heads usually more than 2 cm in diameter; inflorescence of 1 to several heads, corymbiform
Involucres woolly; leaves over 3 cm wide, elliptic-ovate ..... *Senecio*
Involucres glandular, never woolly; leaves less than 3 cm wide, narrowly spatulate ..... *Grindelia*
Leaves with conspicuously pinnately lobed margins
Leaves spinose ..... *Sonchus*
Leaves not spinose
Plants rhizomatous; heads radiate; stems without basal rosette of leaves ..... *Chrysanthemum*
Plants not rhizomatous; heads ligulate; stems with basal rosette of leaves
Involucres glandular and pubescent .. *Crepis*
Involucres glabrous or sparsely pubescent, never glandular
Plants subscapose, flowering stalks bearing a few much reduced leaves; tap-rooted ..... *Hypochaeris*
Plants not subscapose, stems with leaves not much reduced; fibrous-rooted ..... *Lapsana*
Leaves compound, pinnately dissected
Inflorescence terminating in a congested raceme-form cluster ..... *Franseria*
Inflorescence corymbiform
Leaves glabrous; rays white, elongate, over 1 cm long ..... *Anthemis*

Leaves woolly-pubescent; rays white, pink or yellow, less than 0.5 cm long
Heads less than 0.5 cm in diameter; rays white or pink ..... *Achillea*
Heads more than 1 cm in diameter; rays yellow ..... *Tanacetum*

Flower heads with inconspicuous ray flowers, or ray flowers absent

Leaves simple, entire or with 2 or 3 teeth
Leaves linear-lanceolate; involucral bracts without subulate hooked tips
Plants glabrous; heads not congested into compact inflorescences; maritime ..... *Cotula*
Plants tomentose or woolly-pubescent on stems and lower leaf surfaces; heads congested, nonmaritime
Involucral bracts brownish-green; plants not rhizomatous, annual or biennial ..... *Gnaphalium*
Involucral bracts pearly-white; plants rhizomatous, perennial ..... *Anaphalis*
Leaves cordate; involucral bracts with subulate hooked tips ..... *Arctium*
Leaves pinnately compound, or simple and palmately or pinnately lobed or cleft
Leaves compound, pinnately dissected
Receptacle conspicuously conic; heads rayless; plants annual ..... *Matricaria*
Receptacle flat or slightly convex; heads rayless or with inconspicuous rays; plants perennial
Uppermost heads sessile and congested into a compact cylindrical racemiform terminal cluster; plants prostrate with trailing stems ..... *Franseria*
Uppermost heads pedunculate, not congested; plants upright
Inflorescence corymbiform; plants rhizomatous ..... *Tanacetum*
Inflorescence paniculiform; plants not rhizomatous ..... *Artemisia*
Leaves simple, palmately or pinnately lobed or cleft
Leaves palmately lobed, long-petioled ..... *Petasites*
Leaves pinnately lobed or cleft, short-petioled or sessile
Leaves never spiny margined; plants annual .... *Senecio*
Leaves always spiny margined; plants biennial or perennial ..... *Cirsium*

Achillea

527. Achillea millefolium L., Sp. Pl. 2: 899: 1753.
A. borealis Bong., Mém. Acad. St. Pétersb. VI. 2: 149. 1832.
A. lanulosa Nutt., J. Acad. Phila. 7: 36. 1834.

GRAHAM ISLAND: between Queen Charoltte City and Skidegate Village, *CST20928*, *CTS34676*, *CTS34792;* Tlell, *CST22104;* Lepas Bay, *CST22607;* Tow Hill; *CST22668;* 1½ mi S of Jungle Beach, *CST23464;* Juskatla, *S3519;* Masset Spit, *CT35702;* Dakwa, July 29, 1901, *Newcombe* (V).

MORESBY ISLAND: head of Cumshewa Inlet, *CST21970;* East Copper Island, *CST22201;* Hotspring Island, *CST22284;* Echo Harbour, *CST22316;* Skedans Islands, *CST22393;* Fairfax Inlet, *CT23524;* Kaisun, *CT36554*, July 15, 1897, *Newcombe* (V); Sandspit, *Foster & Joslin 29* (DAO, UBC); islet off Bolkus Islands, *Foster & Joslin 84* (DAO, UBC); Copper Creek, *Foster & Joslin 75* (UBC); Tuft Islets, *Foster & Joslin 76C* (UBC); Tar Islands, *Joslin 78* (UBC).

The taxonomic disposition of this polymorphic taxon is difficult to assess in spite of the extensive biosystematic study done by the Carnegie Institution at Stanford. Recent authors, for example, Cronquist (*in* Hitchcock *et al.*, 1955), have included all western populations in *A. millefolium*, recognizing that both native and introduced plants often make up the composition of any one local population. In a recent study by Mulligan and Bassett (1959), chromosome numbers and pollen grain measurements were established for a large number of specimens from Canada and the United States. Pollen grain measurements indicate that hexaploids occur along the Pacific and Atlantic coasts and in northern Canada. Although the authors have maintained the name *A. borealis* for the western hexaploid population, there seems to be no distinct morphological separation from *A. millefolium* of Europe and it is probably best to treat the North American hexaploids as part of this latter species.

Examination of the pollen from the Queen Charlotte Island material indicates that all specimens belong to a hexaploid race. *Achillea* is a common native throughout the Queen Charlottes in both lowland and alpine habitats.

Anaphalis

528. Anaphalis margaritacea (L.) Benth. & Hook., Gen. Pl. 2: 303. 1873.

GRAHAM ISLAND: Tlell, *CST23245;* about 3 mi NW of Tlell, *CST23479;* mouth of Oeanda River, *CT35885.*

MORESBY ISLAND: between Sandspit and Copper Bay, *CST23200;* Mt. de la Touche, *CT23526;* Skidegate Lake, *CT36061.*

The six collections of *Anaphalis* from the Queen Charlotte Islands are comprised of robust, broad-leaved plants. This phase has been referred to var. *occidentalis* Greene by some authors. *Anaphalis margaritacea* is a highly poly-

morphic species that is in need of a thorough study and we feel it is unrealistic to recognize either this variety or the other segregates which are considered to occur in British Columbia. There appears to be no sharp break morphologically, geographically or ecologically between the various segregates that have been proposed.

This species is common along roadsides and is found in many of the logged-over areas on the Islands. It is essentially a lowland species, but is found occasionally at low elevations on mountain slopes in the Queen Charlotte Ranges.

Anthemis

529. *Anthemis cotula L., Sp. Pl. 2: 894. 1753.

MORESBY ISLAND: Sandspit, *CT36071.*

A few plants of *A. cotula* were found in a newly seeded lawn in front of the Islander Motel at Sandspit. This species is a common introduction on southern Vancouver Island and the adjacent mainland, where it is an aggressive weed in disturbed habitats along roadsides and in cultivated fields.

Apargidium

530. Apargidium boreale (Bong.) T. & G., Fl. N. Am. 2: 474. 1843.

GRAHAM ISLAND: near Tow Hill, *CST21160*, *CST22715;* 7½ mi S of Masset, *CST21262;* 8 and 9 mi SE of Port Clements, *CST21356*, *T135;* Empire Anchorage, *CS21468;* Yakoun River Delta, *CST21550*, *CT35466;* McClinton Bay, *CST21597;* Tan Mtn., *CST21604;* 3 and 4 mi NW of Tlell, *CST22071* (DAOM), *CT35455;* Langara Island, *CST22501;* between Ells and Mercer pts., *CST22880;* Newton Pt., *CST22962;* Shields Bay, *CT23361;* Dawson Inlet, *CTS35099;* Aug. 1961, *Foster & Bigg* (UBC); about 15 mi S of Masset, *CT35571;* Kumdis Creek Delta, *CT36117;* Naden Harbour, *CT36857;* NW of Queen Charlotte City, July 10, 1952, *Schmidt;* MacIntosh Meadows, Aug. 23, 1961, *Foster & Bigg* (UBC); Tlell River, July 14, 1912, *Green* (UBC); Skidegate, July 1901, *Newcombe* (V).

MORESBY ISLAND: Chaatl Narrows, *CST21759;* Newcombe Peak, *CST22015;* Bigsby Inlet, *CST22126;* Echo Harbour, *CST22368;* Mt. de la Touche, *CT23529;* Fairfax Inlet, *CT23621;* Anna Inlet, *CTS34945;* Upper Victoria Lake, *CT35798;* Kootenay Inlet, *CT36169;* Takakia Lake, *Foster & Joslin 50* (UBC).

There is much morphological variation in the large series of *Apargidium* that we collected on the Queen Charlotte Islands. Its leaves are linear to narrowly elliptic and entire or remotely and obscurely toothed; its bracts are acute to long acuminate; and its solitary heads range from narrowly to broadly campanulate. In spite of this variation there appears to be no clear line of demarcation between the various types.

Apargidium boreale is one of the most common and widely distributed species throughout the Charlottes. It is predominantly a plant of bogs and wet meadows, but its tolerance to a wide range of lowland and alpine habitats is evident from our field notes: for example, rocky bluffs, grassy river flats, boggy mountain slopes, saline flats, windswept cols, and mountain summits.

Arctium

531. ***Arctium minus** (Hill) Bernh., Syst. Verz. Pfl. Erf. 154. 1800.

GRAHAM ISLAND: between Millar Creek and Skidegate Village, *CT36690A;* Queen Charlotte City, *CT36971.*

MORESBY ISLAND: Sandspit, *CT23679, CT35162, CT37006.*

Arctium minus was only noted as a roadside weed in the vicinity of the airport at Sandspit, at Queen Charlotte City and a few miles north of Skidegate Village. A number of segregates have been recognized and the collections from the Islands appear to belong to the robust, large-headed ssp. *nemorosum* (Lej.) Syme.

Arnica

Leaf blades tapering gradually into winged petioles; pappus tawny, subplumose . . . . . *A. amplexicaulis*
Base of leaf blades truncate to subcordate; pappus white, barbellate . . . . . *A. latifolia*

532. Arnica amplexicaulis Nutt., Trans. Amer. Phil. Soc. II. 7: 408. 1841.
A. amplexicaulis ssp. *prima* Maguire, Brittonia 4: 472. 1943.

GRAHAM ISLAND: Blackwater Creek, *S3531, CTS35060;* Honna River, *CT36935;* Yakoun Lake, Aug. 1895. *Newcombe* (V).

MORESBY ISLAND: Mt. de la Touche, *CT23586;* Mt. Moresby, *CT36440;* Sunday Inlet, *CT36617.*

Arnica amplexicaulis is considered by Maguire (1943) to consist of two races, which he distinguishes as follows:

Cauline leaves 5-7 pairs, the lower 2 or 3 pairs petioled, the margins only inconspicuously dentate-serrate; stems mostly mono- or tri-cephalous; plants of the Alaskan coast region and islands . . . . . ssp. *prima*
Cauline leaves 5-12 pairs, mostly all sessile, the margins mostly conspicuously sharply serrate-dentate; stems mostly with (3-)5-7(-9) heads; plants ranging from Alaska to California and Montana . . . . . ssp. *amplexicaulis*

The Queen Charlotte Island material has 3 to 7 pairs of conspicuously serrate-dentate leaves, the lower pairs either sessile or petiolate, and the flowering

stems mono- to tri-cephalous or occasionally pentacephalous. As such, they are intermediate between the typical phase and ssp. *prima*, which Maguire states is a clearly distinct race. In 1961 *A. amplexicaulis* was collected at 15 different stations on Vancouver Island in order to assess the amount of variation between and within small populations. The Vancouver Island plants have 1 to 6 pairs of almost entire to conspicuously serrate-dentate leaves with the basal pairs sessile (in one collection petiolate) and flowering stems with 1 to 9 heads. There is certainly little correlation between the characters emphasized by Maguire for the two subspecies on the basis of the collections we have examined from the Charlottes, Vancouver Island and elsewhere along the British Columbia – Alaska coast and we feel that ssp. *prima* should not be recognized. It is of interest that a collection (*Calder 6089A*) from the Kenai Peninsula in Alaska has the most conspicuously serrate leaves we have seen in this species.

Arnica amplexicaulis was found only twice during the 1957 survey, but in 1964 a number of collections were made in or along the eastern flanks of the Queen Charlotte Ranges. It is found along rocky river banks at low elevations and on cliffs and in rocky runnels well below tree line on mountain slopes.

533. Arnica latifolia Bong., Mém. Acad. St. Pétersb. VI. 2: 147. 1832.

GRAHAM ISLAND: McClinton Bay, *CST21637;* Shields Bay, *CT23331, CT23369;* Long Inlet, *CT35961.*

MORESBY ISLAND: Takakia Lake, *CST23046, CT36296;* Mt. de la Touche, *CT23525;* Mt. Russ, *CT36151;* Mt. Moresby, *CT36440A.*

Arnica latifolia is a polymorphic species widely distributed throughout British Columbia and extending to southern Yukon and along the Alaska coast to Kodiak Island. In a monograph of *Arnica*, Maguire (1943) recognized Rydberg's *A. gracilis* as a distinct species, but in a recent floristic treatment of the Pacific Northwest, Cronquist (*in* Hitchock *et al.*, 1955, p.52) considered it to be a variety of *A. latifolia.* Although the disposition of *A. gracilis* is still obscure, there is no problem with the Queen Charlotte Island material because it clearly belongs to the typical phase that is based on a Mertens collection from Sitka in the Alaska panhandle.

This species occurs in rocky runnels or on cliff ledges in alpine or subalpine habitats throughout the Queen Charlotte Ranges, and occasionally along stream banks at lower elevations.

Artemisia

534. Artemisia arctica Less., Linnaea 6: 213. 1831.

A. longepedunculata Rudolphi ex Bess., Nouv. Mém. Soc. Nat. Mosc. 3: 77. 1834.
A. norvegica var. *pacifica* A. Gray, Syn. Fl. 1: 371. 1884.
A. norvegica sensu Amer. auth., as to North American plants.

MORESBY ISLAND: Takakia Lake, *CT36309, CT36337;* Mt. Moresby, *CT36406.*

Artemisia arctica, a widely distributed species of the North American Cordilleran region, occurs in Alaska and Yukon and extends as far south as Colorado and California. Its geographical area also includes eastern Asia. The taxonomic relationship of *A. arctica* to *A. norvegica* Fries has been discussed by Hultén (1950, p. 1560) and we are following his opinion and those of other European authors in maintaining the North American – Eastern Asiatic entity as a distinct species. All plants from the Charlottes are conspicuously pubescent, but, as Hultén (1930, p. 178) notes in his discussion of *A. arctica* in a flora of Kamchatka, the leaves and stems are floccose when young and become progressively more glabrous as the plants mature. The population from the Charlottes has glabrous involucral bracts and cannot be considered as one of the two segregates, var. *beringensis* Hult. and ssp. *comata* (Rydb.) Hult., recognized by Hultén in his *Flora of Alaska and Yukon.*

This species is rare on the Queen Charlotte Islands. During a total of eight days spent in the alpine region of Takakia Lake one small colony consisting of 30 to 40 sterile rosettes was observed on an open grassy stabilized talus slope at the west end of the lake, and a few large vegetative plants in early bud were seen growing on rock ledges in a north-facing runnel along the south side of the lake. The only other occurrence of this species was a single sterile rosette in a runnel along the north side of Mount Moresby.

Aster

535. Aster subspicatus Nees, Gen. et Sp. Aster. 74. 1832.

A. foliaceus Lindl. in DC., Prodr. 5: 228. 1836, as to northern coastal British Columbia and Alaska plants.

A. foliaceus var. *frondeus sensu* Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 80. 1921.

GRAHAM ISLAND: Yakoun River Delta, *CST21558* (DAOM), *CT23502, CT35473;* Yakoun Lake, Aug. 1895, *Newcombe* (V).

MORESBY ISLAND: East Copper Island, *CST22216;* Limestone Island, *CST22422A;* Mt. de la Touche, *CT23522;* Upper Victoria Lake, *CT35767;* Ninstints, July 8, 1903, *Newcombe* (V).

Two closely related species of *Aster* have been described from the Alaska coast: *A. subspicatus* Nees, based on a Haenke collection from Fort Mulgrave (Yakutat Bay) north of the Alaska panhandle, and *A. foliaceus* Lindl. from Unalaska at the base of the Aleutian Chain. Cronquist (*in* Hitchcock *et al.*, 1955, p. 97) states that *A. subspicatus* is "somewhat similar to *A. foliaceus*, and even more variable, extreme forms approaching *A. eatonii*, *A. laevis*, or *A. ciliolatus*, as well as passing into *A. foliaceus*." On the basis of Cronquist's key and descriptions the only significant difference between these two Alaska species appears to be in the type of involucral bract. In *A. subspicatus* they are described as having evident scarious margins near the base with the chartaceous portion yellowish or brownish, while in *A. foliaceus* the chartaceous portion, if present, is usually white- or green-tinged. The collections we have seen from along the northern

British Columbia and Alaska coasts are so variable as to the type and coloration of the involucral bracts that we believe only a single species should be recognized. A similar decision was reached by Hultén (1950, p. 1497). If only a single species is involved, it will necessitate a realignment of the many varieties recognized in *A. foliaceus.*

Aster subspicatus is of sporadic occurrence in the Queen Charlotte Islands. Plants with thick, essentially entire leaves, and many flower heads with acute but not conspicuously pointed involucral bracts were found in exposed situations on rock cliffs along the east coast of Moresby Island. Plants with one or a few flower heads were collected in more protected habitats on the slopes of Mount de la Touche between 400 and 1,400 ft and at the Yakoun River Delta in Masset Inlet. These latter collections have thinner, more obscurely toothed leaves and more conspicuously pointed involucral bracts. Possibly two races occur, but we believe they should not be formally recognized until a larger series of specimens have been examined, including the relevant types.

Bellis

536. *Bellis perennis L., Sp. Pl. 2: 886. 1753.

GRAHAM ISLAND: near Lawnhill, *CST20901;* between Queen Charlotte City and Skidegate Village, *CST20924;* Tow Hill, *CST21300;* Langara Island, *CST22535;* Skidegate, June 1, 1914, *Green* (UBC).

MORESBY ISLAND: between Sandspit and Cape Chroustcheff, *CST20994, CT35159;* East Copper Island, *CST22211;* Alliford Bay, *Foster & Joslin 22* (UBC); Sandspit, *Foster & Joslin 33* (UBC).

Bellis perennis is well-established in many places in the settled areas of Graham and Moresby islands. It is found only at the coast on open bluffs, in meadows and in the grassy swards around old habitations and abandoned Haida villages, where it has persisted in spite of severe competition from more aggressive species.

In British Columbia, as far as we are aware, *Bellis* only occurs west of the Coast Mountains.

Chrysanthemum

537. *Chrysanthemum leucanthemum L., Sp. Pl. 2: 888. 1753.
C. leucanthemum var. *pinnatifidum sensu* Amer. auth., *non* Lecoq & Lamotte, Cat. Pl. Vasc. Fr. 227. 1847.

GRAHAM ISLAND: 2½ mi S of Masset *CST22804, CT35580, CT36835;* Yakoun River Delta, *CST23501.*

MORESBY ISLAND: Sandspit, *Foster & Joslin 26* (UBC); Alliford Bay, *Foster & Joslin 35* (DAO, UBC).

The *C. leucanthemum* complex of Europe has been treated recently by

Böcher and Larsen (1957), and the North American plants have been discussed by Mulligan (1958). Only the widely distributed diploid occurs in the Queen Charlotte Islands. It is a relatively rare introduction restricted to settled areas near the east coast. The tetraploid, *C. ircutianum* Turcz., is readily distinguished from the diploid of the Charlottes by a number of leaf characters, and by larger pollen grains.

Cirsium

Leaves essentially smooth, glabrous to arachnoid pubescent above
  Flowers dioecious; heads up to 2.5 cm in diameter; rhizomatous ..... *C. arvense*
  Flowers perfect; heads larger than 2.5 cm in diameter; taprooted ..... *C. brevistylum*
Leaves scabrous, spinulose above ..... *C. vulgare*

538. *Cirsium arvense (L.) Scop., Fl. Carn. ed. 2. 2: 126. 1772.

GRAHAM ISLAND: about 2½ mi S of Tlell, *CST23406;* Jungle Beach, *CT35450;* 1 mi W of Queen Charlotte City, *CT36951.*

MORESBY ISLAND: E end of Skidegate Lake, *CT23626;* Skidegate Lake, *CT36729.*

Cirsium arvense is one of the most noxious weeds of agricultural areas in many parts of Canada, but is only of sporadic occurrence on the Queen Charlotte Islands. It is essentially a roadside weed and is especially common between Sandspit and Moresby Logging Camp on Moresby Island and from Queen Charlotte City to Tlell along the east coast of Graham Island. A few colonies were noted on Limestone and South Low Islands off the east coast of Moresby Island.

539. *Cirsium brevistylum Cronq., Leafl. West. Bot. 7: 26. 1953.

GRAHAM ISLAND: 2½ mi S of Masset, *CT35581, CT36834.*

MORESBY ISLAND: East Copper Island, *CST22255.*

The cytotaxonomy and distribution of *C. brevistylum* and closely related *C. edule* Nutt. have been discussed in detail in a recent paper by Moore and Frankton (1962). In British Columbia *C. brevistylum* is essentially a lowland species of meadows, coastal bluffs, clearings and other open habitats. It is found throughout Vancouver Island and there are a number of records from the lower Fraser River valley. There is then a gap in its distribution eastwards to the Monashee Mountains; from here it extends sporadically to the Rockies. In the interior of the province it occurs as far north as Sicamous and at the coast its northern limit is on the Queen Charlotte Islands. There are no records from the

mainland coast between the north end of Vancouver Island and the latitude of the Charlottes.

In 1957, when we surveyed the east coast of Moresby Island by boat, a few plants of *C. brevistylum* were collected in a small clearing by an old cabin on East Copper Island. The only other records for the Charlottes are the two 1964 collections from near Masset about 2½ miles along the road to Port Clements. It was locally common at this station for about 50 yards along a roadside bank with a number of adventives including *Chrysanthemum leucanthemum* L. and *Cirsium vulgare* (Savi) Airy-Shaw. At the time of the 1957 survey we thought that *C. brevistylum* might be native to the Charlottes, but it now seems reasonable to assume that it was introduced at both stations.

540. *Cirsium vulgare (Savi) Airy-Shaw, Repert. Sp. Nov. 43: 303. 1938.

GRAHAM ISLAND: between Queen Charlotte City and Skidegate Village, *CST20922* (DAOM); Tlell, *CST23246;* Lawn Pt., *CT35442;* between Skidegate Village and Millar Creek, *CT36690;* Queen Charlotte City, *CT36943.*

MORESBY ISLAND: Sandspit, *CST21837* (DAOM), *CT35161;* Limestone Island, *CST22405* (DAOM); near Skidegate Lake Bridge, *CT23634;* Hotspring Island, *Foster & Joslin 86A.*

Cirsium vulgare is a well-established weed along roadsides and in settlements along the east coasts of Graham and Moresby islands. The only record from the west coast is from Kaisun, an abandoned Haida village, where it was noted in grassy forest openings at the shoreline.

Cotula

541. *Cotula coronopifolia L., Sp. Pl. 2: 892. 1753.

GRAHAM ISLAND: Queen Charlotte City, *CST23027, CT36939.*

A well-established South African adventive in saline marshes and on muddy tidal flats in many places along the Pacific coast from the Alaska panhandle southwards. In the Charlottes it was only found on the western outskirts of Queen Charlotte City in saline meadows growing in association with such species as *Stellaria humifusa* Rottb., *Triglochin maritimum* L., and *Puccinellia pumila* (Vasey) Hitchc.

Crepis

542. *Crepis capillaris (L.) Wallr., Linnaea 14: 657. 1840.

GRAHAM ISLAND: between Queen Charlotte City and Skidegate, *CTS34781;* Queen Charlotte City, *CT35846.*

MORESBY ISLAND: Sandspit, *CT36082.*

Crepis capillaris was overlooked in the 1957 survey, but it is common in a few places in disturbed roadside habitats between the Haida Hotel at Queen Charlotte City and Kendall's garage at Skidegate. A few plants were found in the weedy meadow in front of the Islander Motel at Sandspit. This species is a common weed along roadsides and in pastures in the coastal regions of extreme southwestern British Columbia, especially in the lower Fraser River valley and on southern Vancouver Island.

Erigeron

Involucres conspicuously pubescent, the hairs with prominent light to dark purple crosswalls; rays white, about 4 mm long ..... *E. humilis*

Involucres rarely conspicuously pubescent, the hairs never with prominent purple crosswalls; rays light to dark mauve, occasionally white, over 6 mm long..... *E. peregrinus*

543. Erigeron humilis Grah., Edinb. New Phil. J. 1828: 175. 1828.
E. unalaschensis Vierh., Beih. Bot. Centr. 19: 492. 1906.

MORESBY ISLAND: Takakia Lake, *CT36340*.

Erigeron humilis is one of the most common, widely distributed, and uniform alpine species of *Erigeron* in British Columbia. There are a number of records from the Coast Mountains but this species is rare on the Queen Charlotte Islands. It was found only on cliff ledges at about 2,100 ft along the north shore of Takakia Lake. It was growing in association with *Heuchera glabra* Willd., *Poa stenantha* Trin., and *Draba lonchocarpa* ssp. *kamtschatica* (Ledeb.) Calder & Taylor.

544. Erigeron peregrinus (Pursh) Greene, Pittonia 3: 166. 1897.
E. peregrinus var. *dawsonii* Greene, *l.c.*
E. salsuginosus sensu Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 82. 1921.

GRAHAM ISLAND: Empire Anchorage, *CS21477;* McClinton Bay, *CST21676;* Langara Island, *CST22500;* between Ells and Mercer pts., *CST-22879A & B;* Newton Pt., *CST22955;* Shields Bay, *CT23296*, *CT23363;* Blackwater Creek, *T57;* Dawson Inlet, *CTS35102;* Yakoun Lake, Aug. 1895, *Newcombe* (V); Hippa Island, June 13, 1911, *Newcombe* (V).

MORESBY ISLAND: Chaatl Narrows, *CST21751;* head of Cumshewa Inlet, *CST22043*, *CT35222;* Bigsby Inlet, *CST22123*, *CTS34891;* Echo Harbour, *CST22355;* Takakia Lake, *CST23048;* Mt. de la Touche, *CT23523;* Anna Inlet, *CTS34968;* Upper Victoria Lake, *CT35722;* Kootenay Inlet, *CT36191;* Mt. Moresby, *CT36429*, Aug. 1961, *Foster & Bigg* (UBC); Kaisun, *CT36551;* Sunday Inlet, *CT36611;* Chaatl Island, Aug. 1895, *Newcombe* (V); Ninstints, 1903, *Newcombe* (V); Kitgoro Inlet, July 1897, *Newcombe* (V), June 30, 1897, *Newcombe* (CAN); June 14, 1878 (labelled 1877), *Dawson* (CAN – Type of *E. peregrinus* var. *dawsonii*).

In a monograph of the genus *Erigeron*, Cronquist (1947) discusses the *E. peregrinus* complex, which he considers to be comprised of two subspecies each with a number of minor varieties. The coastal race ssp. *peregrinus* extends from the Commander and Aleutian islands south along the Alaska – British Columbia coast to northern Washington. South of Vancouver Island the essentially inland ssp. *callianthemus* (Greene) Cronq. is the common race at the coast, whereas ssp. *peregrinus* is encountered occasionally in lowland coastal bogs.

In 1897 Greene described var. *dawsonii* on the basis of a single collection made by Dawson in his survey of the Queen Charlotte Islands in 1878. This variety has been recognized by Cronquist, who also considers that var. *peregrinus* occurs on the Islands. Greene described the leaves of var. *dawsonii* as being reduced upwards and distant from one another, whereas the leaves of var. *peregrinus* are stated to be larger and essentially alike and close set. We have seen the type of var. *dawsonii*, and it is a good match for a number of our collections, but there is so much variation in the disposition and relative size of the leaves that we do not feel this variety merits recognition. Plants of both types and numerous intermediates are often found in the same colony. A few collections show a tendency towards ssp. *callianthemus* as the involucral bracts are not conspicuously villous and tend to be slightly glandular.

Erigeron peregrinus is common throughout the Queen Charlotte Ranges from sea level to well above tree line. It occurs sparingly along stream banks and in bogs along the eastern flanks of the mountains.

Franseria

545. Franseria chamissonis Less., Linnaea 6: 507. 1831.

GRAHAM ISLAND: Lepas Bay, *CST22605;* Masset Spit, *CST22636;* Lina Island, *CST22919;* Tlell, *CST22998*, *CT35431;* Dakwa, July 1901, *Newcombe* (V); Masset, Sept. 8, 1902, *Newcombe* (V).

MORESBY ISLAND: Sandspit, *CST23211*, *CT35342.*

Franseria chamissonis is a common beach species wherever stabilized sand or gravel is found above the upper tidal zone. It was particularly abundant on the extensive beaches at Tlell, Sandspit, Rose Spit, and Masset. A single sterile rosette was observed near Port Clements on the south side of Masset Inlet. Although there appears to be a gap in its distribution between Cape Scott at the north end of Vancouver Island and the Queen Charlotte Islands, it probably occurs in suitable habitats along the intervening mainland coast. The collections cited are the most northerly known records for this species.

Franseria chamissonis is extremely variable with respect to leaf shape and cutting. This leaf variation has been used to delimit a number of taxa along the Pacific coast. In a biosystematic study in 1937, Wiggins and Stockwell recognized two subspecies, ssp. *typica* (ssp. *chamissonis*) with leaves serrate to the cuneate bases, and ssp. *bipinnatisecta* with leaves once to thrice pinnatifid. From the results of their field observations and experimental studies they state that "in

most places the maritime *Franseria* is heterozygous and unstable," and that "they have the same chromosome number, both mitosis and meiosis are normal, and cytologically they are indistinguishable." Their studies and our own observations confirm that there are no evident cytological or geographical bases for separation of the two subspecies. We have observed all forms of morphological variation in a large population on Long Beach on the west coast of Vancouver Island, and we think that the extremes in variation would be better treated as forms. All the collections from the Queen Charlotte Islands have pinnatifid leaves and are referred to f. *bipinnatisecta* (Less.) Calder & Taylor.

Gnaphalium

546. *Gnaphalium uliginosum L., Sp. Pl. 2: 856. 1783.

GRAHAM ISLAND: 4 mi SE of Port Clements, *CST22824;* Shields Bay, *CT23385;* about 2½ mi S of Tlell, *CST23407*, *CT35947*, *CT36878;* near Juskatla, *S3508*.

MORESBY ISLAND: Alliford Bay, *CST23237;* Skidegate Lake, *CT23640;* Moresby Logging Camp, *CT36488*.

Gnaphalium uliginosum is an occasional weed of disturbed habitats, especially dry gravelly ground. It was collected on river flats, a lake beach, in gravel pits and along roadsides.

Grindelia

547. Grindelia integrifolia DC., Prodr. 5: 315. 1836.

G. stricta DC., Prodr. 7: 278. 1838.
G. oregana A. Gray, Syn. Fl. N. Amer. 1: 118. 1884.
G. lanata Greene, Pittonia 2: 290. 1889; *G. stricta* var. *lanata* (Greene) Steyerm., Ann. Missouri Bot. Gard. 21: 563. 1934.
G. macrophylla Greene, Pittonia 3: 297. 1898; *G. stricta* var. *macrophylla* (Greene) Steyerm., *l.c.*, 561; *G. integrifolia* var. *macrophylla* (Greene) Cronq., Vasc. Pl. Pacif. NW. 5: 207. 1955.
G. integrifolia var. *aestivalis* Henry, Fl. South. B.C. 291. 1915.
G. integrifolia var. *autumnalis* Henry, *l.c.*
G. collina Henry, *l.c.; G. stricta* var. *collina* (Henry) Steyerm., *l.c.*, 564.
G. oregana ssp. *wilkesiana* Piper in Piper & Beattie, Fl. NW. Coast 363. 1915.
G. andersonii Piper, Proc. Biol. Soc. Wash. 31: 77. 1918.
G. nana sensu Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 83. 1921.
G. aggregata Steyerm., *l.c.*, 566.
G. stricta f. *elongata* Steyerm., *l.c.*, 560.

GRAHAM ISLAND: Masset, *CST22643*, July 1901, *Newcombe* (V); Delkatla Inlet, *CT35594;* Long Inlet, July 26, 1897, *Newcombe* (CAN).

MORESBY ISLAND: head of Cumshewa Inlet, *CST21968*, *CT23681*, *CT36242;* Skedans Islands, *CST22391;* mouth of Deena River, *CT23777*.

The recent treatment by Cronquist (*in* Hitchcock *et al.*, 1955) of the highly

polymorphic *Grindelia* has greatly clarified the nomenclatural status of a number of species in the Pacific Northwest. He considers that all coastal material belongs to a single species *G. integrifolia*, and he recognizes two ecotypes at varietal rank, the maritime var. *macrophylla* (Greene) Cronq. and the nonmaritime var. *integrifolia*. We have carefully examined a series of British Columbia specimens of this species and a number of collections from coastal Washington, Oregon and California, but we are unable to distinguish var. *macrophylla* from the typical phase on the basis of his key. We hesitate to give formal recognition to these ecotypes and prefer to regard all coastal plants from British Columbia as belonging to a single variable taxon *G. integrifolia*.

The material from the Queen Charlotte Islands clearly illustrates the effect of the environment on growth habit. Plants on open exposed rocky coastlines are robust and much branched and their basal leaves are not conspicuously longer than the cauline ones, e.g., *CST23681* and *CST22391;* however, plants in saline sedge meadows are more spindly in habit, less branched, and their basal leaves are conspicuously elongated in comparison to the cauline ones, e.g. *CT23777*.

Grindelia integrifolia is probably restricted to the east and northeast coasts of Graham and Moresby islands. Although it has been reported from Alaska by a number of authors, it was not included by Hultén in his *Flora of Alaska and Yukon*.

Hieracium

Flowers white; pedicels sparsely glandular-pubescent . . . *H. albiflorum*
Flowers yellow or brick-red; pedicels copiously glandular-pubescent
  Flowers yellow; cauline leaves not much reduced; basal leaves sparsely pubescent, lacking stellate hairs; alpine . . . . . *H. triste*
  Flowers brick-red; cauline leaves much reduced; basal leaves conspicuously pubescent, stellate hairs present; lowland . . . . . *H. aurantiacum*

548. Hieracium albiflorum Hook., Fl. Bor.-Amer. 1: 298. 1833.

GRAHAM ISLAND: between Queen Charlotte City and Skidegate Village, *CST21417*, *CST21705*, *CTS34786;* Torrens Island, *CST22445;* about 3 mi E of Masset, *CST22760;* Tlell, *CST22820;* Skidegate, July 1901, *Newcombe* (V); Long Inlet, July 24, 1897, *Newcombe* (CAN).

MORESBY ISLAND: near Alliford Bay, *CST21830*, *CT36258*.

Hieracium albiflorum on the Queen Charlottes is a species of usually dry, open shoreline habitats and is restricted to the eastern sections of Graham and Moresby islands. It apparently cannot tolerate the extremely high rainfall and closed forest of the exposed west coast. It is significant that it has a similar type of habitat preference in southeastern Alaska and Vancouver Island.

Plants from the northern part of the species range, including the Queen Charlotte Islands, have conspicuous though scattered grayish to black hairs on the involucre; the pedicels and at least the base of the bracts are short glandular-pubescent. In somewhat drier habitats in southern British Columbia both inland and at the coast, the involucral bracts vary from inconspicuously glandular-pubescent to subglabrous. There is, however, no sharp morphological distinction separating the northern and southern populations.

549. *Hieracium aurantiacum L., Sp. Pl. 2: 801. 1753.

MORESBY ISLAND: Alliford Bay, *CT36090.*

Hieracium aurantiacum is rare in the Cordilleran region of North America. Only a single locality, Bremerton, Wash., is cited in the recent *Vascular Plants of the Pacific Northwest*, but there are a few collections from British Columbia in our herbarium. The closely related *H. brunneocroceum* Pugsley has apparently been introduced into North America, but we have been unable to segregate this species from *H. aurantiacum* on the basis of distinctions given in the *Flora of the British Isles* by Clapham *et al.* Both these species have been introduced from central Europe and are common garden escapes.

Hieracium aurantiacum was locally common in grassy clearings around the demolished buildings of the former airbase. It is an aggressive and tenacious garden escape at this site.

550. Hieracium triste Willd. ex Sprengel, Syst. Veg. 3: 640. 1826.
H. triste var. *tristiforme* Zahn in Engler, Pflanzenreich IV. 79: 1135. 1922.
H. gracile var. *alaskanum sensu* Hult., Fl. Alaska & Yukon 10: 1668. 1950.

GRAHAM ISLAND: Shields Bay, *CT23342;* Dawson Harbour, July 24, 1897, *Newcombe* (CAN, V).

MORESBY ISLAND: Takakia Lake, *CST23052, CT36281;* Mt. de la Touche, *CT23530;* Mosquito Mtn., *CT23706;* Mt. Moresby, *CT36457, CT36499.*

Hieracium triste occurs in both western South and North America. In North America it is comprised of two races, a northern one, ssp. *triste*, and a southern one, ssp. *gracile* (A. Gray) Calder & Taylor. These two races were first recognized by Gray (1880) and he considered that the southern race, ssp. *gracile*, extended only into southern British Columbia. Hultén (1950, p. 1668-1670) included both *H. gracile* and *H. triste* in his *Flora of Alaska and Yukon*, thus following Zahn's (1922) monograph of the genus. It is worth noting that although Hultén has referred the nonglandular Alaska material to *H. gracile* var. *alaskanum* described by Zahn, the description by Zahn clearly indicates (1922, p. 1133) that the involucres and pedicels are glandular in this variety. The collections Hultén cites as belonging to this variety should all be transferred to *H. triste* ssp. *triste*. In his discussion of the two species, Hultén states that *H. triste* is connected with *H.*

gracile through a chain of intermediates, which he includes under *H. triste* var. *tristiforme*. We have examined approximately 100 collections of this complex, including material from California and the Aleutian Islands, and can recognize only a single species, *H. triste*. This species is comprised of two races, ssp. *triste* and ssp. *gracile*, which can be distinguished as follows:

H. triste ssp. *triste:* nonglandular; involucre and pedicels densely pilose with long (up to 4 mm) grayish hairs, which often extend down the scape, lower part of scape finely stellate puberulent; abaxial surface of leaves usually long hairy. Distribution: coastal Alaska and northern British Columbia; extending up Skeena River drainage system.

H. triste ssp. *gracile:* glandular; involucre and pedicels generally with some nonglandular gray hairs, but not densely pilose; scapes usually subglabrous with fine stellate puberulence; abaxial surface of leaves never conspicuously hairy. Distribution: Yukon, Alberta and central British Columbia south to Colorado and California.

Where the two subspecies meet in British Columbia and in Yukon and Alaska, intermediate forms occur. Plants from the Queen Charlotte Islands are best considered as part of the typical phase, but in any one population there may be some specimens that approach ssp. *gracile*. *Hieracium triste* was found only in alpine or subalpine habitats of the Queen Charlotte Ranges.

Hypochaeris

551. *Hypochaeris radicata L., Sp. Pl. 1: 811. 1753.

GRAHAM ISLAND: between Queen Charlotte City and Skidegate Village, *CST21706*, *CTS34791*, *CT35391;* near Masset Spit, *CST22818;* 3 mi N of Port Clements, *T141;* Tlell, *CTS34633*.

MORESBY ISLAND: Sandspit, *CST21835*, *CT35340*.

Hypochaeris radicata is a common weed in fields, on disturbed ground and along roadsides in the settled areas of eastern Graham and northeastern Moresby islands.

Lapsana

552. *Lapsana communis L., Sp. Pl. 1: 811. 1753.

GRAHAM ISLAND: Masset, *CST22817;* Queen Charlotte City, *CST-23017*, *CT35845*.

MORESBY ISLAND: Alliford Bay, *CST23236*.

This Eurasian species is well established in a few places on rocky or gravelly roadside banks at the outskirts of Masset, at Alliford Bay and between Queen Charlotte City and Skidegate.

Leontodon

553. *Leontodon nudicaulis A. Gray ssp. **taraxacoides** (Vill.) Shinz & Thell, Bull. Herb. Boiss. II. 7: 389. 1907.
L. leysseri G. Beck, Fl. Nied.-Oesterr. 1312. 1893.
L. hastilis sensu Henry, Fl. South. B.C. 325. 1915.

MORESBY ISLAND: Alliford Bay, *CT36091.*

There is considerable nomenclatural confusion regarding the correct name for this species as discussed by Cronquist (*in* Hitchcock *et al.*, 1955, p. 254) and we are tentatively referring our material to *L. nudicaulis* ssp. *taraxacoides.*

This species is not a widespread weed in British Columbia. On the Queen Charlotte Islands *Leontodon* was found only around the demolished building sites of the wartime airbase at Alliford Bay. In this large population there is considerable variation in the leaf dentation, but all plants undoubtedly belong to a single entity.

Matricaria

554. *Matricaria matricarioides (Less.) Porter, Mem. Torrey Club 5: 341. 1894.
M. suaveolens (Pursh) Buch., Fl. Bremen ed. 4. 142. 1894.

GRAHAM ISLAND: Tlell, *CT35917;* Masset, *CT36915.*

MORESBY ISLAND: islet off Bolkus Islands, *CST22235;* Hotspring Island, *CST22282;* islets off Alliford Bay, *CST23232B;* Sandspit, *CT36038;* Horn Rock, *CT36519*, Aug. 9, 1957, *Mills;* Gowdas Islands, *CT36579.*

Matricaria matricarioides is not a common weed in the settled areas of the Queen Charlotte Islands, but a few colonies were noted at Queen Charlotte City, Masset and Tlell. It was also found forming luxuriant colonies on a number of small rocky islets off the coast in highly nitrified areas near the nesting grounds of seabirds. It is obviously introduced on these islets and it is the only species on the Charlottes for which there is good evidence that its seeds are disseminated by migrating sea birds.

Petasites

555. Petasites nivalis Greene, Pittonia 2: 18. 1889.
P. hyperboreus Rydb., N. Amer. Fl. 34: 312. 1927, in part.
P. frigidus var. *nivalis* (Greene) Cronq., Leafl. West. Bot. 7: 30. 1953, in part.

GRAHAM ISLAND: Shields Bay, *CT23373.*

MORESBY ISLAND: Takakia Lake, *CST23057, CT36268;* Mosquito Mtn., *CT23720;* between Cumshewa and Peel inlets, *CT35198;* Mt. Moresby, *CT36938.*

The Queen Charlotte Island material lies at the center of the primarily coastal Cordilleran population of *P. nivalis.* The taxonomic disposition of this

population has been variously treated by different authors. Greene (1889) coupled his lucid description of this species from Mount Rainier in Washington with a realistic discussion of its habitat preferences and projected distribution. He indicated that *P. nivalis* belonged exclusively to subalpine heights, whereas *P. palmatus* A. Gray was very common in the woods that skirted the remoter bases of Rainier. Similar habitat preferences exist for these two species along the British Columbia coast.

In 1927 Rydberg described *P. hyperboreus* on the basis of a Macoun collection from a mountain summit west of the Skagit River in British Columbia. He distinguished this species from *P. nivalis* by differences in the depth of lobing of the leaves. Examination of a series of subalpine material of the *nivalis* complex from British Columbia indicates that, although the depth of leaf lobes is variable, all specimens should be referred to a single taxon, *P. nivalis*. This species can be readily distinguished from *P. palmatus*, which has much more deeply lobed leaves. Similarly *P. nivalis* cannot be confused with either the northern and arctic *P. frigidus* (L.) E.M. Fries or the lowland *P. sagittatus* (Banks) A. Gray, as neither of these species possesses deeply lobed and secondarily toothed leaf margins. Clearly *P. hyperboreus* represents the same taxon as the earlier-described *P. nivalis*. Furthermore the distribution of *P. hyperboreus* given by Rydberg is undoubtedly wrong (Porsild, 1943, p. 75).

On the basis of a survey of the Alaskan and Canadian material in our institute, we cannot support the conservative treatment accorded *Petasites* by Cronquist (*in* Hitchcock *et al.*, 1955) in which only two species are recognized in British Columbia, Alaska and Yukon. We are maintaining *P. frigidus*, *P. sagittatus*, *P. palmatus* and *P. nivalis* as distinct species. Careful examination of extensive herbarium material and field observations, which reveal the nature and extent of breeding relationships between these species, provides the bases for our decision to recognize the four entities listed at the specific level.

Petasites nivalis is the only species of this complex that occurs on the Queen Charlotte Islands. It is restricted to the main mountain mass centered around Skidegate Inlet. It was particularly abundant along margins of alpine creeks and rivulets in the vicinity of Takakia Lake. No flowering material was observed in either the 1957 or 1964 survey.

Prenanthes

556. Prenanthes alata (Hook.) D. Dietr., Syn. Pl. 4: 1309. 1847.
P. hastata sensu Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 85. 1921.

GRAHAM ISLAND: Tow Hill, *CST21183* (DAOM), *CST22666;* Langara Island, *CST22550;* Lepas Bay, *CST22593;* Dawson Inlet, *CST22862;* between Ells and Mercer pts., *CST22881;* Newton Pt., *CST22994* (DAOM); Shields Bay, *CT23308;* Millar Creek, *CST23455;* Blackwater Creek, *S3533*, *CTS35069;* 4 mi S of Juskatla, May 30, 1952, *Schmidt* (DAO, UBC); Yakoun Lake, Aug. 1895, *Newcombe* (V); Dawson Harbour, June 26, 1897, *Newcombe* (CAN); Masset, 1901, *Newcombe* (V).

MORESBY ISLAND: 3 mi E of Skidegate Lake, *CST21918;* Gray Bay,

CST23423; Mt. de la Touche, *CT23590;* mouth of Deena River, *CT23792;* Limestone Island, *CTS34827;* Kaisun, *CT36532;* Yakulanas Bay, *CT36658;* Thurston Harbour, Sept. 12, 1923, *Newcombe* (V); Copper Bay, July 3, 1960, *Foster & Joslin* (UBC).

Prenanthes alata is found throughout the Queen Charlotte Islands. Most of our records are from rocky bluffs or cliffs at the shoreline, but it occasionally occurs above tree line on talus slopes. It was also noted along stream banks and the margins of coniferous woods bordering beaches, and in a few rock runnels on forested slopes. It is a species that prefers open or partially open habitats where competition is not very severe.

Senecio

Plants annual; leaves pinnatifid; rays usually absent
- Bracteoles never black-tipped; principal involucral bracts about 13 ..... *S. sylvaticus*
- Bracteoles black-tipped; principal involucral bracts about 21 ..... *S. vulgaris*

Plants perennial; leaves never pinnatifid; rays usually present
- Blades of all cauline leaves well developed, largest over 7 cm long, never lobed
  - Leaves broadly ovate; involucral bracts conspicuously lanate-pubescent; a maritime beach species .... *S. psuedo-arnica*
  - Leaves triangular; involucral bracts never lanate-pubescent; an alpine or subalpine species ..... *S. triangularis*
- Blades of cauline leaves progressively reduced upwards, largest less than 5 cm long, often lobed
  - Basal leaves serrate- or crenate-margined, never conspicuously lobed ..... *S. cymbalarioides*
  - Basal leaves conspicuously 3- to 7-lobed ..... *S. newcombei*

557. Senecio cymbalarioides Nutt. ssp. **moresbiensis** Calder & Taylor, Can. J. Bot. 43:1399. 1965. **Figures 178-180.**

S. resedifolius sensu Carter & Newcombe, Prelim. Cat. Fl. Vanc. & Q.C.I. 85. 1921.

GRAHAM ISLAND: McClinton Bay, *CST21537;* between Ells and Mercer pts., *CST22878A & B;* Newton Pt., *CST22956;* Jalun Lake, *CT35667.*

MORESBY ISLAND: Chaatl Narrows, *CST21752;* Takakia Lake, *CST-23066, CT36323;* Mosquito Mtn., *CT23711A & B, CT36454;* Bigsby Inlet, *CTS34887;* Upper Victoria Lake, *CT35735;* Kootenay Inlet, *CT36195;* Mt. Moresby, Aug. 1961, *Foster & Bigg* (UBC).

Senecio cymbalarioides belongs to a polymorphic complex of taxa that have been placed in the sect. *Aurei* Rydb. This complex includes *S. resedifolius* Less., *S. hyperborealis* Greenm., *S. conterminus* Greenm., *S. pauciflorus* Pursh, *S.*



Figures 178–180. *Senecio cymbalarioides* Nutt. ssp. *moresbiensis* Calder & Taylor. 178. Habit of lowland bog plant (× ½). 179. Habit of montane heath plant (× ½). 180. Flower head (× 1½).

pauperculus Michx., and *S. indecorus* Greene. In order to clarify the relationship of the population from the Queen Charlotte Islands to the other members of the complex it is necessary to briefly summarize the taxonomic status of the seven species enumerated. Barkley (1962) has recently dealt with the sect. *Aurei*, but the relationships between the various species are still obscure, especially with respect to their occurrence and disposition in western Canada and Alaska. It is beyond the scope of this *Flora* to critically analyze Barkley's treatment but a few generalizations must of necessity be made in order to place the population from the Charlottes in alignment with the already known species. The seven species have been traditionally separated into two groups on the basis of the radiate versus eradiate nature of the flower, thus *S. pauciflorus* and *S. indecorus*, being eradiate, represent one species cluster. This flower character is not absolute as Fernald (1924 *a*, p. 117) has pointed out, but in general it provides a method of separation. Both species are widespread, but neither is a common element of the Pacific coast vegetation. *Senecio resedifolius* and the two closely related somewhat dubious species *S. conterminus* and *S. hyperborealis* are usually characterized by single flowering heads, although in *S. hyperborealis* and *S. conterminus* there are frequent exceptions. Basal leaves in these three species are usually deeply and irregularly lobed, but they may be lyrate-pinnatifid in *S. resedifolius*. These three taxa are found in Alaska and Yukon and disjunct populations of *S. hyperborealis* and *S. resedifolius* occur in the mountains of northwestern United States and the southern Rocky Mountains of Canada. *Senecio resedifolius* is the only species that reaches Asia, where it is found in the Bering Sea area. None of these three species has a North American Pacific coastal distribution. The fourth species to be considered, *S. pauperculus*, is the most widely distributed of the seven taxa under discussion and can be distinguished from the rest of the group by radiate heads in a corymbose inflorescence. This species is closely related to both *S. indecorus* and *S. pauciflorus*, and the relationship of these three taxa is in dire need of study. The remaining member of the complex, *S. cymbalarioides*, is an essentially monocephalus species that is primarily restricted in its distribution to the interior central Cordilleran region of western North America (Barkley, 1962, p. 392).

The plant of this complex from the Queen Charlotte Islands is closely related to typical *S. cymbalarioides* and, although it may be related to such species as *S. pauperculus* and *S. pauciflorus*, its closest affinities appear to lie with the southern *S. cymbalarioides*. As the evolutionary development of this whole complex is not clear, the taxonomic relationships and origin of the Queen Charlotte population are not definitely known. The disjunct population from the Islands is a distinct race, ssp. *moresbiensis*, that can readily be separated from the typical phase by the following characters: base of involucre possessing a distinctive lanate pubescence with hairs that have a beaded appearance and prominent crosswalls that are sometimes reddish colored; basal leaves ovate, never lobed, regularly serrate- or crenate-margined. In addition to the records from the Charlottes, there is a collection from Port Hardy (*Calder & MacKay 31330*) on Vancouver Island. Subspecies *moresbiensis* consists of two ecoforms on the Charlottes. The montane–lowland shade form is essentially green and the petals are often paler than those of the open bog or rocky-bog ecoform, which is

a slender plant with bright, yellow-orange petals, and dark-red leaves and stems. An example of the presence of these two forms in the same area is seen in collection number *CST22878*. The *A* collection was made in shade along the margin of a brook near the shoreline, whereas the *B* collection is from open rocky and boggy slopes at about 500 ft immediately above. The first collection is a taller, essentially green-colored plant, whereas the *B* collection contains shorter and darkly red-pigmented plants. Clearly these two collections belong to ssp. *moresbiensis* but they indicate the amount of variation that can occur locally between a lowland and montane ecotype. The montane collections are similar to the shade form but are much smaller. Two such ecoforms are also found in *S. pauperculus* in the interior of British Columbia, where plants growing on open gravel flats in marl bogs or in sedge swales are more darkly pigmented and smaller than those growing in nearby woods and meadows.

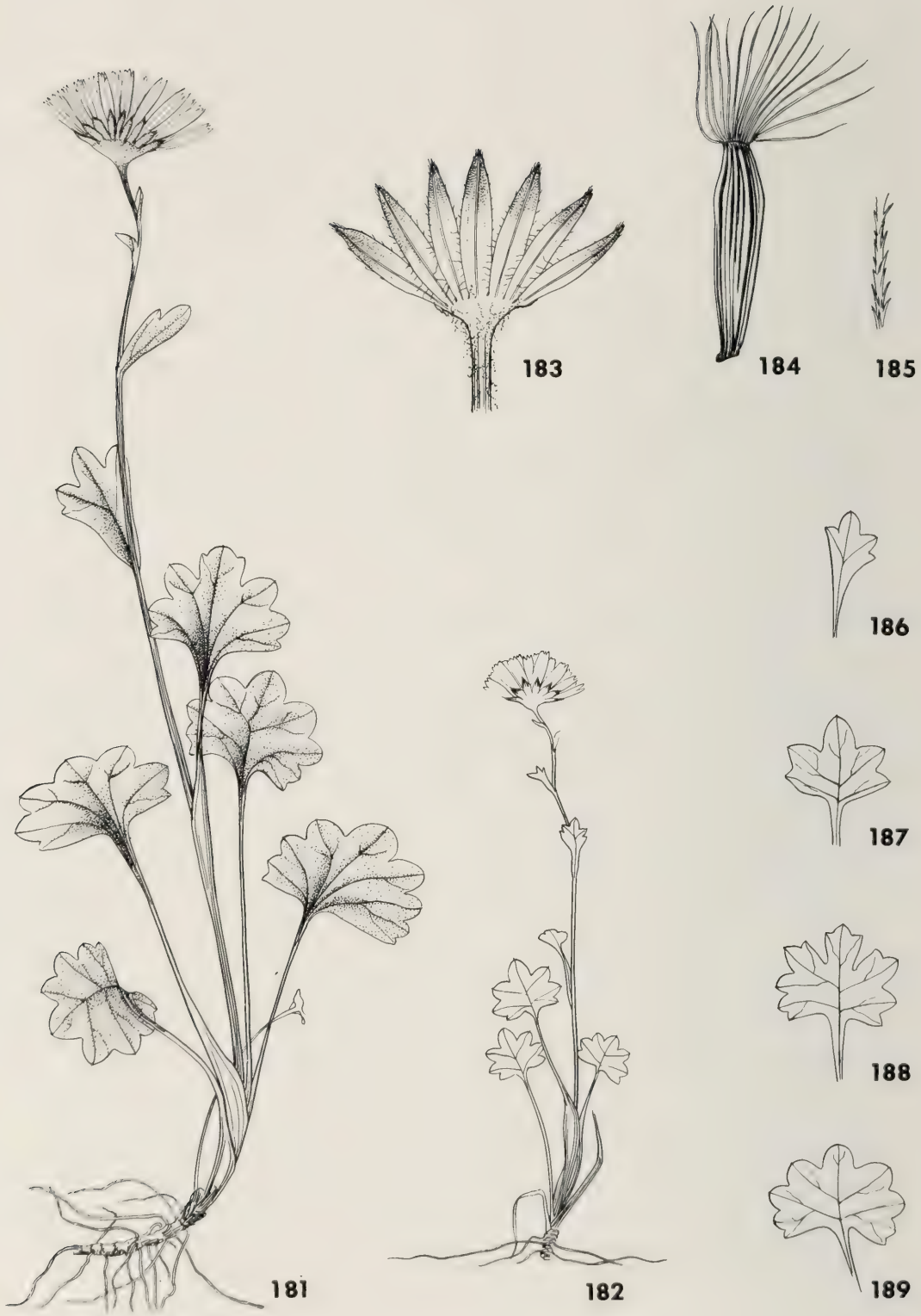
Senecio cymbalarioides ssp. *moresbiensis* is found only in and adjacent to the Queen Charlotte Ranges. It inhabits open, rocky and boggy slopes and bogs along the west flanks of the Ranges as well as open rocky heaths or grassy talus slopes in alpine and subalpine habitats. Frequent associates are *Luetkea pectinata* (Pursh) Kuntze, *Pedicularia ornithorhyncha* Benth., *Cassiope lycopodioides* ssp. *cristapilosa* Calder & Taylor, *Saxifraga taylori* Calder & Savile, *Senecio newcombei* Greene, and *Saxifraga ferruginea* Grah.

558. Senecio newcombei Greene, Pittonia 3: 249. 1897. **Figures 181-190.**

GRAHAM ISLAND: Empire Anchorage, *CS21459;* Tan Mtn., *CST21605;* Dawson Inlet, *CST22842, CTS35114;* between Ells and Mercer pts., *CST22877;* Newton Pt., *CST22987;* Shields Bay, *CT23322, CT23357A, CT23381;* Jalun Lake, *CT35665;* Dawson Harbour, June 28, 1897, *Newcombe* (CAN).

MORESBY ISLAND: Chaatl Narrows, *CST21753;* Newcombe Peak, *CST22007;* Bigsby Inlet, *CST22149, CTS34888;* Echo Harbour, *CST22342;* Takakia Lake, *CST23075, CT36271, Foster & Joslin 52* (UBC); Mt. de la Touche, *CT23528;* Mosquito Mtn., *CT23710, CT36453;* Anna Inlet, *CTS34969;* Upper Victoria Lake, *CT35717;* Kootenay Inlet, *CT36194;* Sunday Inlet, *CT36676;* Tasu Sound, June 26, 1961, *Foster & Bigg* (UBC); Gold Harbour, July 3, 1897, *Newcombe* (V); NE of Buck Channel, June 12, 1959, *Brown* (V); Kitgoro Inlet, June 1897, *Newcombe* (CAN), July 1897, *Newcombe* (V), May 30, 1901, *Newcombe* (V); Mt. Moresby, July 13, 1961 *Foster & Bigg* (UBC).

Senecio newcombei was included by Barkley (1962) in the polytypic section *Aurei* Rydb. and, though its relationships within this section are not clearly understood, it appears to be rather closely related to the monocephalous alpine *S. porteri* Greene of Colorado and Oregon. Like *Saxifraga taylori* Calder & Savile, *Isopyrum savilei* Calder & Taylor, and *Ligusticum calderi* Math. & Const., it belongs to a small group of endemics from the Queen Charlotte Islands that are related to more southern North American floristic elements. According to a letter sent by Dr. Newcombe to Sir George Dawson, he first collected *S. newcombei* at the site of a Norwegian fish camp in the first bay north of Kaisun on



Figures 181–189. *Senecio newcombei* Greene. 181. Habit of large plant (× ½). 182. Habit of small plant (× ½). 183. Involucre (× 3). 184. Achene with pappus (× 7). 185. Pappus bristle (× 30). 186 to 189. Basal leaf variation (× ½).



Figure 190. *Senecio newcombei* Greene and *Saxifraga punctata* L. ssp. *carlottae* Calder & Savile at about 2,000 feet on mountain at head of Shields Bay, Rennell Sound, west coast of Graham Island.

the west coast of Moresby Island. The name of this bay was written as K(a)itgoro, Kaitgaogao or Kaitgaogos by Newcombe who attempted to interpret the sound of the name used by the Haidas for this bay.

Senecio newcombei is found throughout the mountainous regions on the Queen Charlotte Islands. It is best developed on open, rocky and boggy mountain slopes along the west coast and is particularly common on the open heathy and rock talus slopes of the Takakia Lake alpine region. The texture, degree of hairiness, and depth of lobation of leaves varies according to the exposure of the site, and the number of lobes per leaf varies from 5 to 7. This species should be cultivated for it has attractive flowers and foliage.

559. Senecio pseudo-arnica Less., Linnaea 6: 240. 1831. **Figure 191.**

GRAHAM ISLAND: Lepas Bay, *CST22608*, Masset Spit, *CST22647;* mouth of Sangan River, *CST22766*, *CT35596*, *CT36805;* about 2 mi S of Rose Spit, *CT35910*.

The maritime *S. pseudo-arnica* of the Pacific and Atlantic coasts of North America is a highly variable species. It ranges from about 1.5 to at least 7 dm in height, its leaves vary from lingulate and subentire to obovate and conspicuously dentate and the lower surfaces of the leaves are thinly to densely floccose. As pointed out by Hultén (1950, p. 1619), the leaves of the east-coast plant are often more conspicuously serrate, but similar plants are also occasionally found along the Pacific coast. There appears to be no clear line of demarcation between the Atlantic and Pacific coast populations. In British Columbia this species extends south to Vancouver Island, but it is rare in the southern part of its range as suitable habitats are lacking over long stretches of the coastline.

Senecio pseudo-arnica is a species of sand beaches and, on the Queen Charlotte Islands, it has been collected only along the north and east coasts of Graham Island. Its southern limit on the Islands is apparently at Tlell, where there are extensive sand dunes and flats near the mouth of the Tlell River.

560. *Senecio sylvaticus L., Sp. Pl. 2: 868. 1753.

GRAHAM ISLAND: Queen Charlotte City, *CST22486;* near Juskatla, *S3509;* between Skidegate Village and Millar Creek, *CT36693;* west of Queen Charlotte City, *CT36936*.

MORESBY ISLAND: islet off Bolkus Islands, *CST22237A;* Limestone Island, *CST22416;* Gray Bay, *CST23429;* mouth of Deena River, *CT23793;* Dass Pt., *CTS35024;* Kaisun, *CT36534*.

Senecio sylvaticus is a European native that has been widely introduced into North America. Although this species is similar in appearance and habit to *S. vulgaris* L. it occupies different habitats on the Queen Charlotte Islands. A number of collections were made on exposed rocky headlands along the east coast of Moresby Island. In such habitats it appears to be indigenous, but, like



Figure 191. *Senecio pseudo-arnica* Less, habit (× ½).

Matricaria matricarioides (Less.) Porter, it is undoubtedly introduced at these sites. *Senecio sylvaticus* was found at the abandoned Haida village of Kaisun on the west coast of Moresby Island with a number of other weedy species that are usually restricted to the drier eastern coasts of the Islands. These adventives were probably introduced at this ancient settlement by frequent trading visits between the west and east coast villages.

561. Senecio triangularis Hook., Fl. Bor.-Amer. 1: 332. 1834.

GRAHAM ISLAND: Shields Bay, *CT23298;* Long Inlet, *CT35952.*

MORESBY ISLAND: Newcombe Peak, *CST22038* (DAOM); Takakia Lake, *CST23050, CT36338;* Mt. de la Touche, *CT23527;* Mosquito Mtn., *CT23751;* Bigsby Inlet, *CTS34886;* Mt. Moresby, *CT35313, CT36410.*

A number of taxa have been recognized by the size, shape and toothing of leaves in the extremely variable *S. triangularis* complex. Over the past 15 years we have collected a large series of specimens of this species from British Columbia, Alaska and Yukon in order to ascertain whether these variants merit taxonomic recognition. Our studies reveal that differing morphological forms, which have been given taxonomic status, appear to occur at random throughout the total range of the species. Therefore, we are reluctant to accept the segregates proposed and we would include all collections from north of the 49th parallel in *S. triangularis* in the broad sense.

On the Queen Charlotte Islands this species is restricted to the mountain ranges, where it is usually found at or near tree line on open grassy slopes, along the margins of cliffs, on gravel lake shores and along the margins of creeks.

562. *Senecio vulgaris L., Sp. Pl. 2: 867. 1753.

GRAHAM ISLAND: Masset Spit, *CST22635, CTS34725;* 6½ mi E of Masset, *CT35601.*

MORESBY ISLAND: between Sandspit and Cape Chroustcheff, *CST20978;* Sandspit, *CT36027.*

Senecio vulgaris is a widely distributed European weed of disturbed ground and cultivated land in the Pacific Northwest. It is a common element of the weedy vegetation on the sand and gravel spits at both Masset and Sandspit.

SOLIDAGO

Basal leaves large, oblanceolate or spatulate, petioles conspicuously ciliate-margined; cauline leaves reduced and petioles frequently ciliate-margined..... *S. multiradiata*

Basal leaves wanting; lower cauline leaves soon deciduous, the upper numerous and crowded, not much reduced, petioles never ciliate-margined..... *S. canadensis*

563. Solidago canadensis L., Sp. Pl. 2: 878. 1753.
S. lepida DC., Prodr. 5: 339. 1836.

GRAHAM ISLAND: Tlell, *CST22997*, *CT35934*, *CT36880;* Skidegate, Aug. 20, 1911, *Newcombe* (V).

MORESBY ISLAND: Sandspit, *CT23677*.

The Pacific coast population of *S. canadensis* has been frequently treated as a distinct species, *S. lepida* (Hultén, 1950, p. 1485, 1486). The diagnostic characters used to segregate this western species from *S. canadensis* of eastern and central North America are not entirely reliable. We are following Cronquist's recent treatment (*in* Hitchcock *et al.*, 1955), in which the western complex is considered as a part of the wide-ranging and variable *S. canadensis*. He recognizes three varieties for British Columbia and adjacent regions, but he indicates that these subspecific entities may vary to the extent that it becomes difficult to determine them with certainty. We have attempted to identify British Columbia and Alaska material on the basis of Cronquist's key and in general three large groups can be obtained. The northern coastal material, including that from the Queen Charlotte Islands, tends to have less obviously imbricated involucres, with the phyllaries usually more uniform in length and somewhat longer, than those found on the interior specimens. The size of the inflorescence is also used as a character, but the variation found is such that it cannot be used to segregate coastal specimens from those of interior British Columbia. The northern coastal population can be referred to *S. canadensis* var. *subserrata* (DC.) Cronq. Examination of plants from southern Vancouver Island and the adjacent mainland indicates that two types of *S. canadensis* are present in this region. An entity similar to that found on the Queen Charlotte Islands and northward along the Alaska coast can be referred to var. *subserrata*, and another entity in which the more conspicuous imbrication in the involucre resembles that found in plants of the northern interior, may be referred to *S. canadensis* var. *salebrosa* (Piper) M. E. Jones. The third variety is restricted to the dry southern interior of British Columbia and is not relevant to this discussion.

On the basis of our preliminary examination of the variation found in *S. canadensis* from both western and eastern North America there is certainly merit in referring the western material to this wide-ranging species. However, we are reluctant to take a firm stand on the varieties recognized by Cronquist as this must await a detailed study of *S. canadensis* from all parts of its range.

Solidago canadensis occurs only in meadows and on bluffs along the eastern coasts of Graham and Moresby islands and does not form a conspicuous element of the vegetation.

564. Solidago multiradiata Ait., Hort. Kew. 3: 218. 1789.

GRAHAM ISLAND: between Ells and Mercer pts., *CST22929*.

Solidago multiradiata is one of the more colorful late-flowering, lowland or

alpine species found throughout British Columbia. The single collection from the Queen Charlotte Islands was made near sea level on boggy mountain slopes on the exposed west coast. The apparent scarcity of this species in the mountainous areas on the Islands is puzzling because there are many suitable habitats.

Sonchus

565. *Sonchus asper (L.) Hill, Herb. Brit. 1: 47. 1769.

GRAHAM ISLAND: between Queen Charlotte City and Skidegate Village, *CST21723*, *CTS34780;* Jungle Beach, *CST23392;* Queen Charlotte City, *CT23805*, *CT35847;* 2½ and 4 mi S of Masset, *CT35579*, *CST22805*.

MORESBY ISLAND: Sandspit, *CST21849;* Hotspring Island, *CST22300;* Limestone Island, *CST22422;* Copper Creek *Foster & Joslin 40* (UBC).

Sonchus asper has become well-established along roadsides and in other open and disturbed habitats in the eastern sections of Moresby and Graham islands. It is common on the lush, mossy sward around the springs on Hotspring Island, where it was probably introduced many years ago along with such species as *Holcus lanatus* L. and *Aira praecox* L. When Dawson explored the east coast of Moresby Island in 1878, this island was apparently a campsite and resting place for the Haidas. Even today a few families from Skidegate Village usually spend a short period here each summer. It is also well established on cliffs along the south shore of Limestone Island about five miles from the abandoned Indian village of Skedans.

Tanacetum

Plants villous; inflorescence irregularly corymbose, usually composed of few heads about 1 cm or more wide; ray flowers present..... *T. huronense*

Plants sparsely pubescent; inflorescence a flat-topped corymb composed of many heads usually less than 1 cm wide; ray flowers absent..... *T. vulgare*

566. Tanacetum huronense Nutt., Gen. N. Amer. Pl. 2: 141. 1818.
T. douglasii DC., Prodr. 6: 128. 1837; *Chrysanthemum douglasii* (DC) Hult., Fl. Alaska & Yukon 10: 1551. 1950.

GRAHAM ISLAND: Masset Spit, *CST22633;* Tlell, *CST23248*, *CTS35078*, *CT35926*, June 1951, *Cowan* (UBC), July 7, 1952, *Pillsbury* (UBC); mouth of Sangan River, *CT35598;* Mayer Lake, *CT36103;* Dakwa, July 28, 1901, *Newcombe* (V).

The northwest Pacific coast material designated as either *T. douglasii* DC. or *T. huronense* Nutt. has not been compared carefully in recent years with the

eastern population of this complex. Cronquist (*in* Hitchcock *et al.*, 1955) considers the west coast plant to be a distinct species, *T. douglasii*, differing from eastern and northern material in the morphology of the ultimate leaf segments, the number of heads and the degree of development of the rays. After examining a large series of plants from both areas we cannot support the recognition of a separate taxon on the basis of these highly variable diagnostic characters. We do, however, recognize three taxa in the *T. huronense* complex, of which only ssp. *huronense* is pertinent to this discussion. The distribution of the typical phase includes the Pacific coast south to Oregon, Yukon and central Alaska, the Great Lakes and the Atlantic coast south to Maine. This distribution parallels that given by Gray (1884, p. 366) in his *Synoptical Flora of North America* and it is further supported, with respect to the west coast material, by Piper and Beattie (1915) in their *Flora of the Northwest Coast*. The distribution of *T. huronense* ssp. *huronense* is not an unusual one, as there are other essentially maritime species that have similar distributions, for example, *Cakile edentula* (Bigel.) Hook and *Elymus mollis* Trin. The typical phase includes a much wider distributional area than that indicated by Fernald (1935*b*), who described three very weak and poorly defined geographical variants from the northern and eastern parts of North America.

Tanacetum huronense is not a common element of the Queen Charlotte Islands vegetation. It is a sand-dune species and its scattered distribution along the northern and eastern coasts of Graham Island reflects the few suitable habitats that are available for it. Large populations were observed on the extensive gravel spit near Haida and on Rose Spit, and a number of sterile colonies were noted in early June of 1957 when we walked the nine-mile stretch of sand beach between Tow Hill and Rose Spit. *Tanacetum huronense* is frequently associated with *Carex macrocephala* Willd. and *Poa douglasii* ssp. *macrantha* (Vasey) Keck.

567. *Tanacetum vulgare L., Sp. Pl. 2: 884. 1753.

GRAHAM ISLAND: west of Queen Charlotte City, *CT36923*.

In 1964, a single colony of *T. vulgare* was noted in a disturbed roadside habitat near a recently established logging site west of Queen Charlotte City near the mouth of the Honna River. It is well established and appears to be spreading rapidly.

Taraxacum

568. *Taraxacum officinale Weber in Wiggers, Prim. Fl. Holsat. 56. 1780.

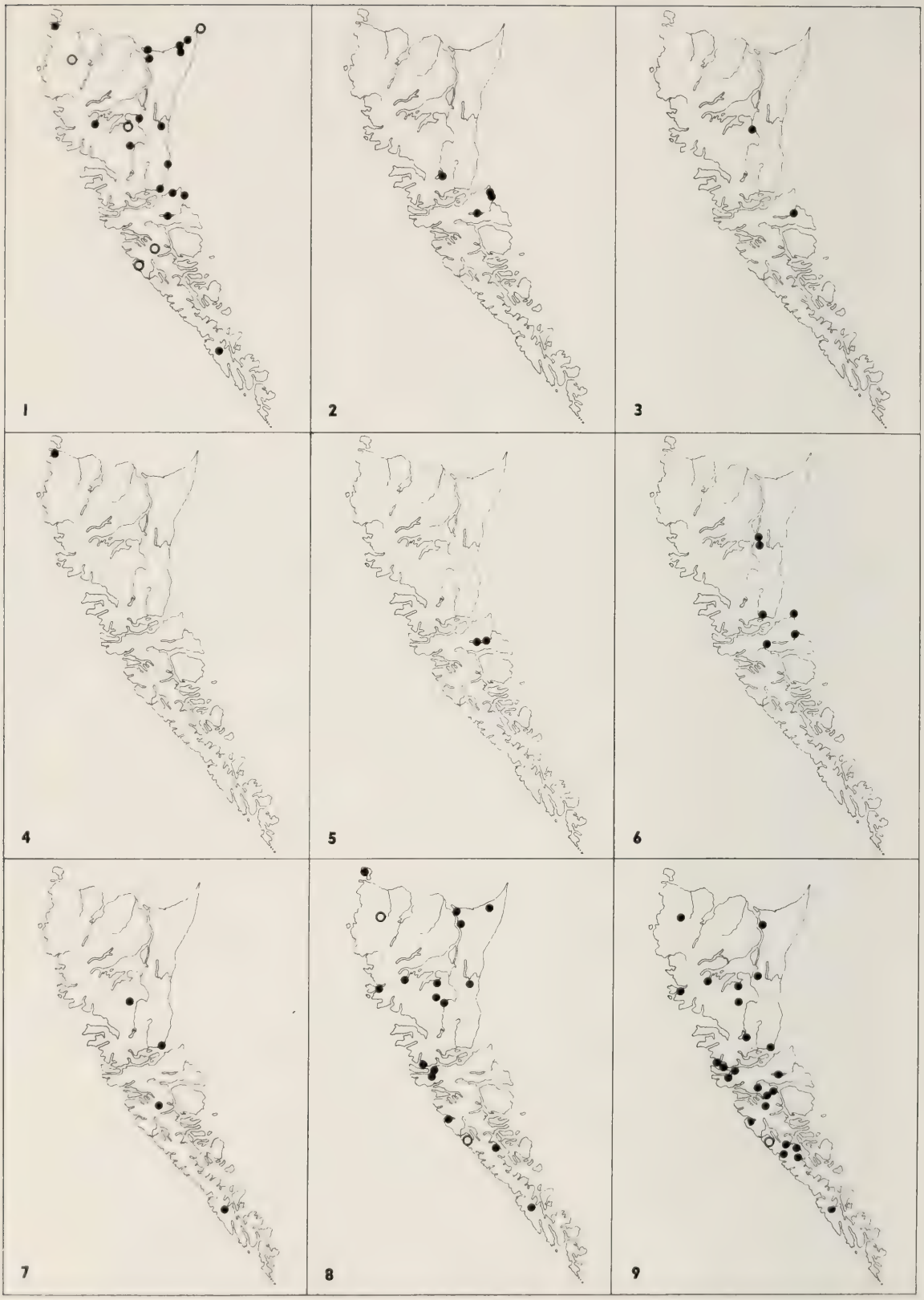
GRAHAM ISLAND: between Queen Charlotte City and Skidegate Village *CST20925*, *CST21428* (DAOM); Queen Charlotte City, *CST23023* (DAOM); Tlell, *CST23179*.

MORESBY ISLAND: between Sandspit and Cape Chroustcheff, *CST20988;* Sandspit, *CT36041*.

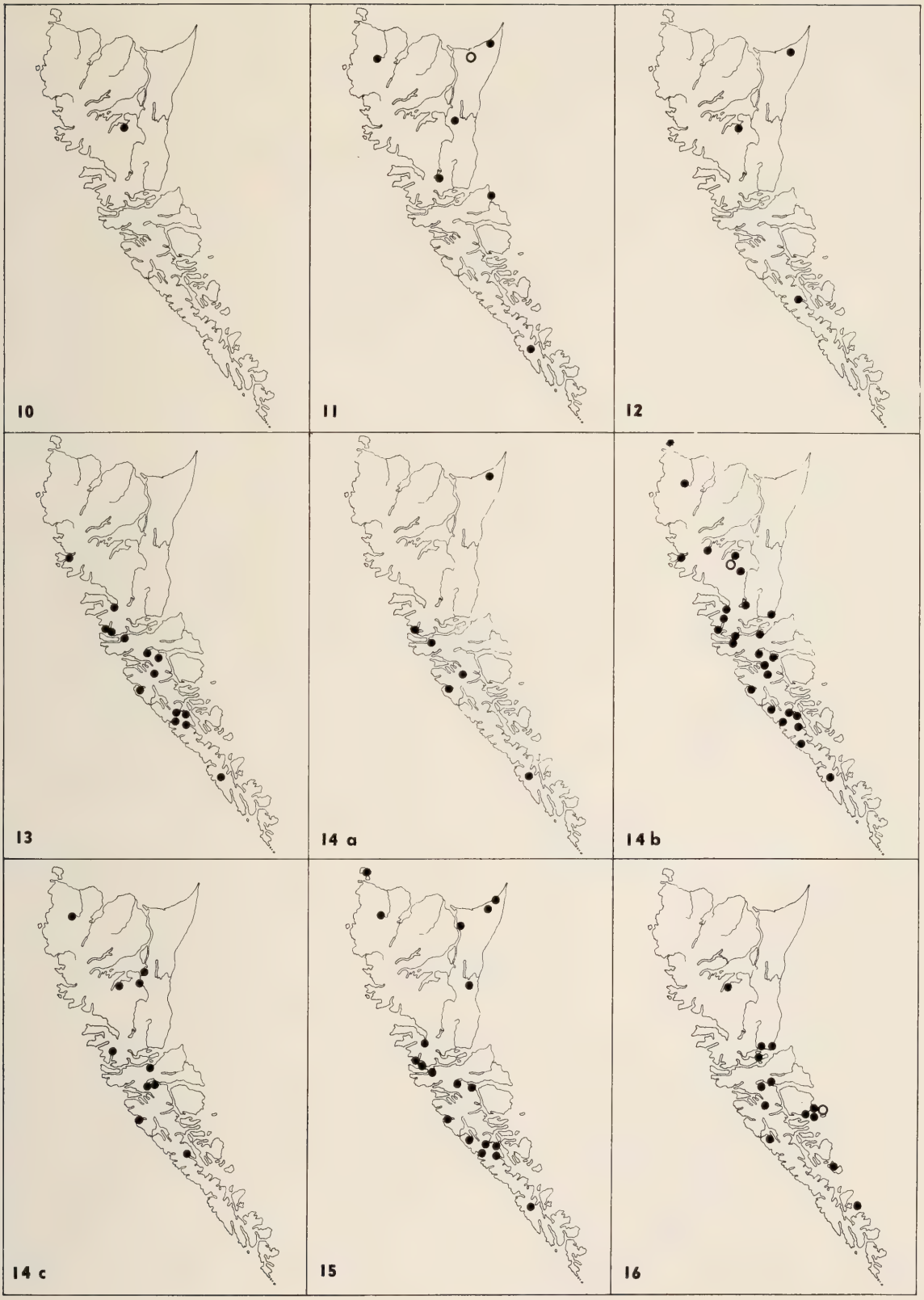
Taraxacum officinale is a common introduced species of cultivated and disturbed areas in and around settlements in the Queen Charlotte Islands.

DISTRIBUTION MAPS

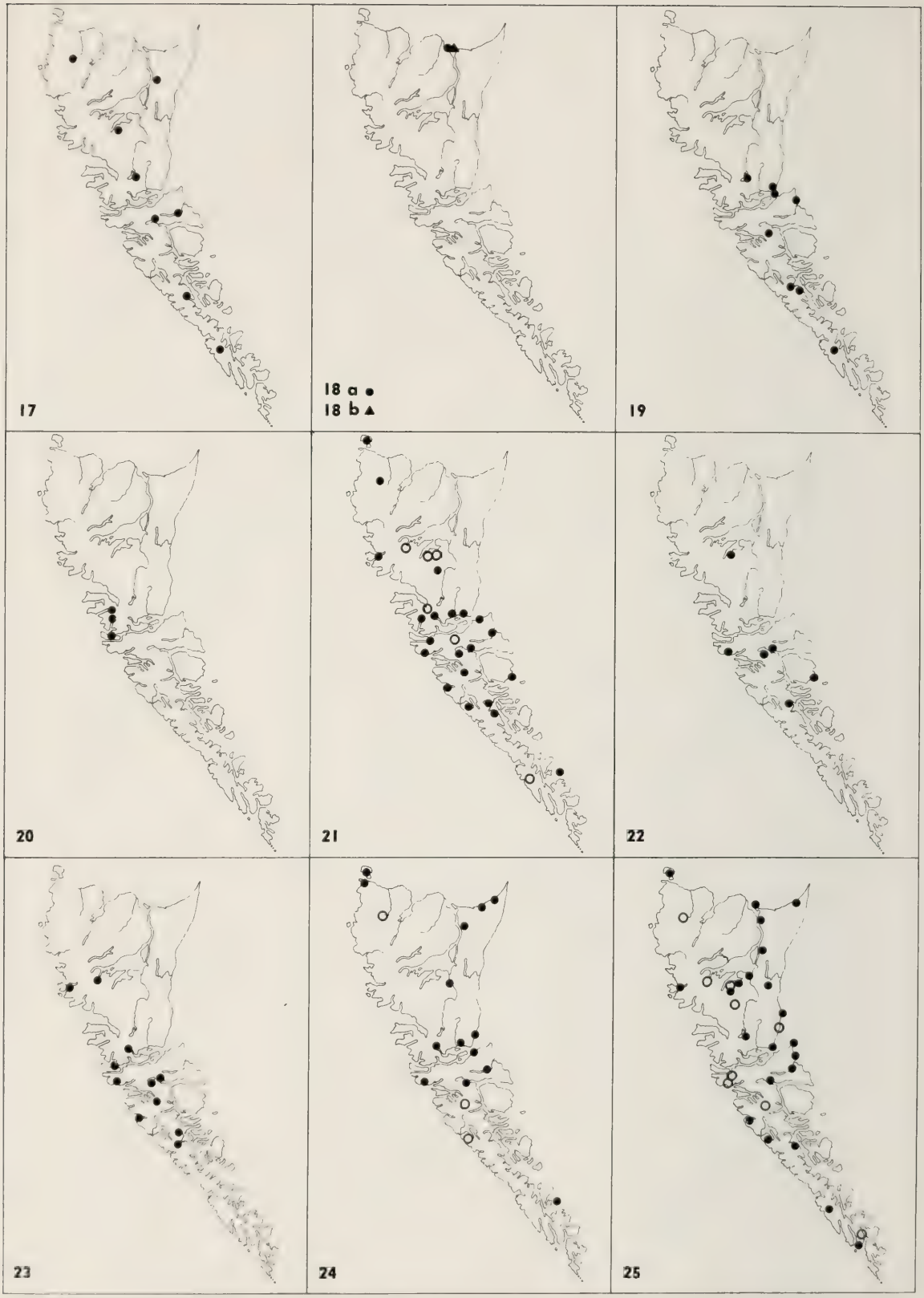
Maps of the 593 taxa found on the Queen Charlotte Islands are numbered and arranged in the same taxonomic sequence found in the systematic portion of this *Flora*. Solid symbols denote specimens examined and housed in herbaria. Open circles indicate site records noted during our two summer surveys. In a few instances, the distributions of more than one taxon are included on one map. In such cases, the different taxa are denoted by distinctive symbols.



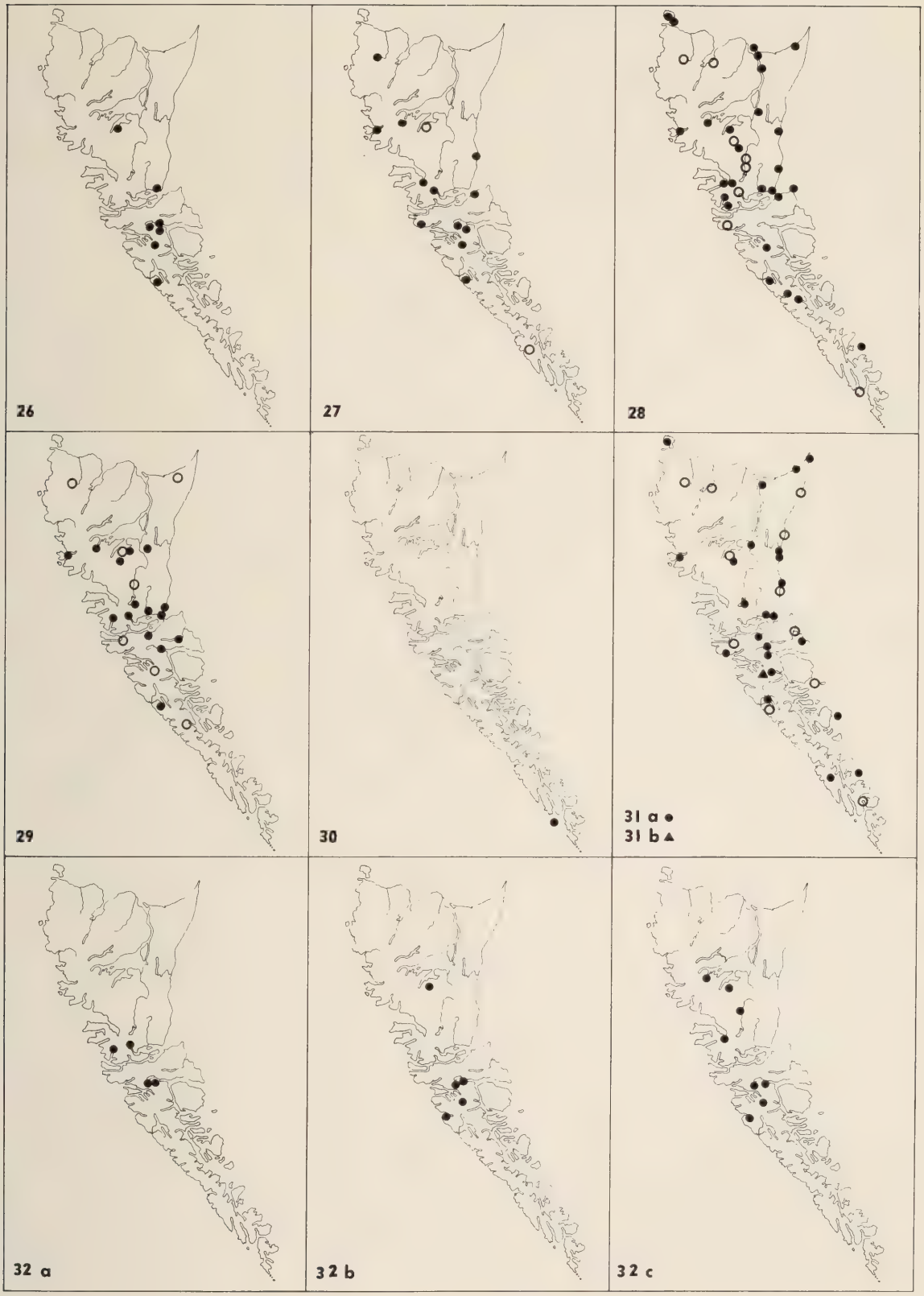
MAPS 1-9. 1. *Equisetum arvense*. 2. *Equisetum fluviatile*. 3. *Equisetum hyemale* ssp. *affine*. 4. *Equisetum hyemale* × *E. variegatum*. 5. *Equisetum palustre*. 6. *Equisetum telmateia*. 7. *Equisetum variegatum* ssp. *alaskanum*. 8. *Lycopodium annotinum*. 9. *Lycopodium clavatum*.



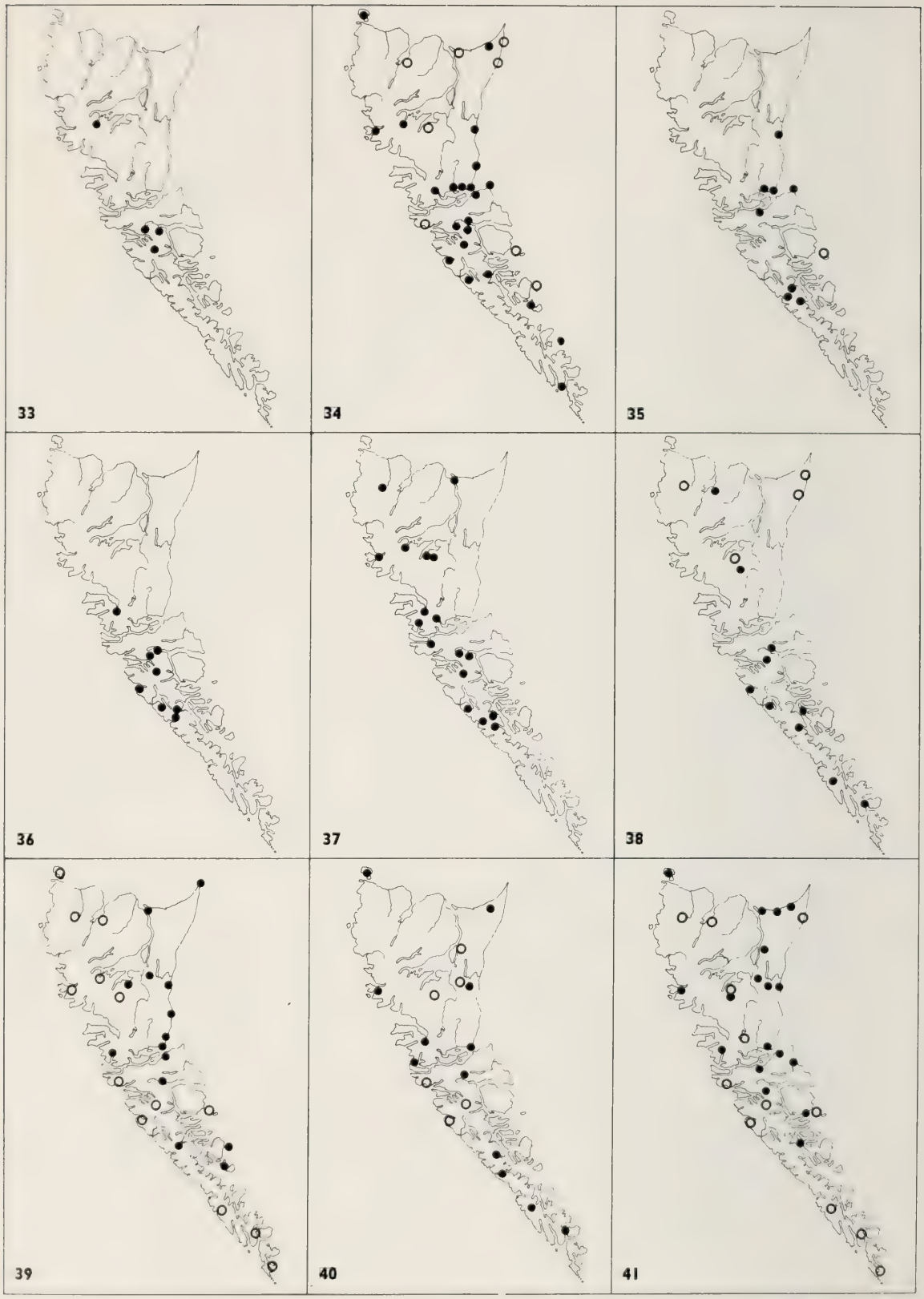
Maps 10-16. 10. *Lycopodium complanatum.* 11. *Lycopodium inundatum.* 12. *Lycopodium obscurum.* 13. *Lycopodium sabinaefolium* ssp. *sitchense.* 14a. *Lycopodium selago* ssp. *selago.* 14b. *Lycopodium selago* ssp. *miyoshianum.* 14c. *Lycopodium selago* ssp. *patens.* 15. *Selaginella selaginoides.* 16. *Selaginella wallacei.*



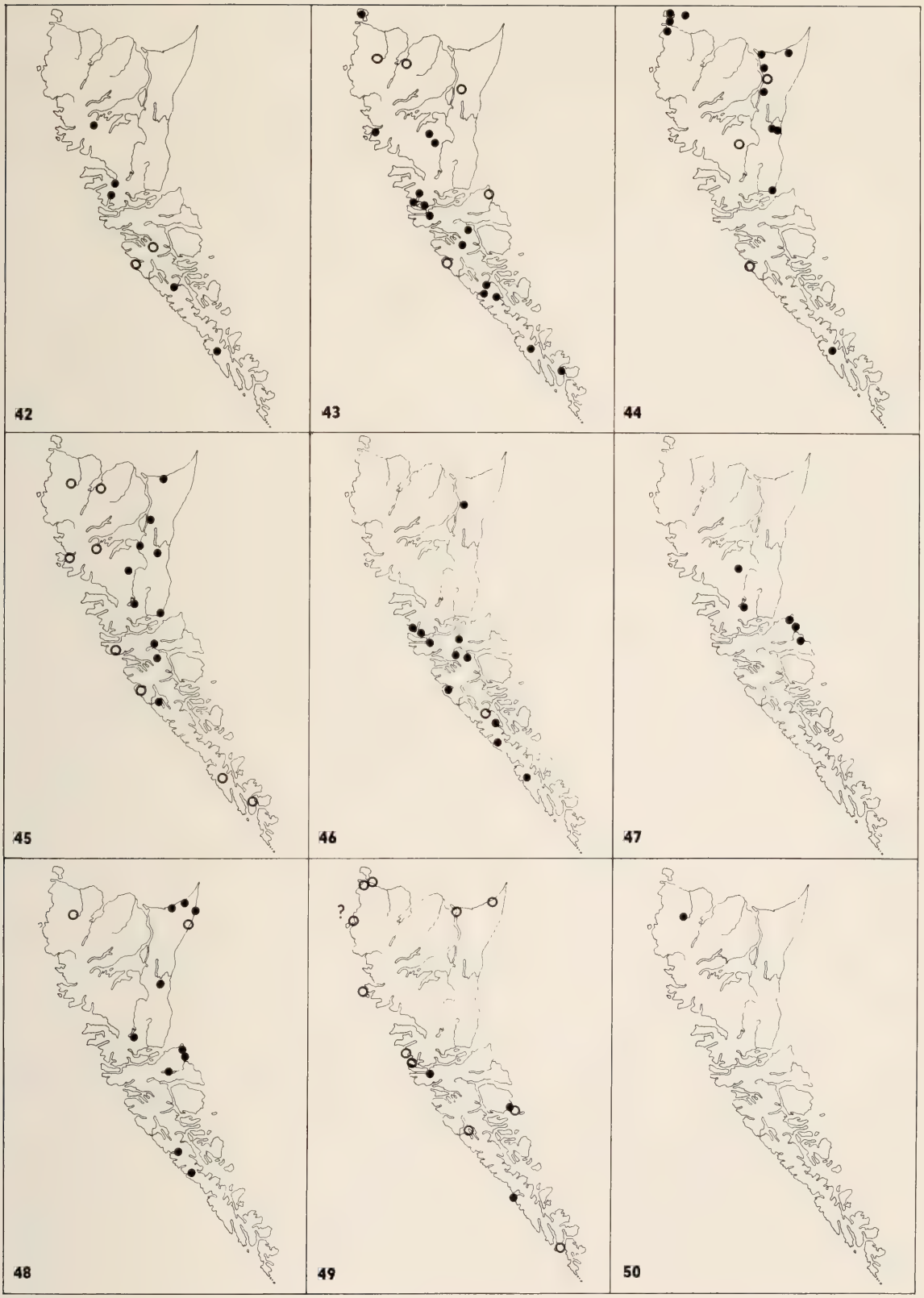
MAPS 17-25. 17. *Isoetes echinospora* ssp. *muricata*. 18a. *Botrychium lunaria* ssp. *lunaria*. 18b. *Botrychium lunaria* ssp. *minganense*. 19. *Botrychium multifidum* ssp. *silaifolium*. 20. *Mecodium wrightii*. 21. *Adiantum pedatum* ssp. *aleuticum*. 22. *Asplenium trichomanes*. 23. *Asplenium viride*. 24. *Athyrium filix-femina* ssp. *cyclosorum*. 25. *Blechnum spicant*.



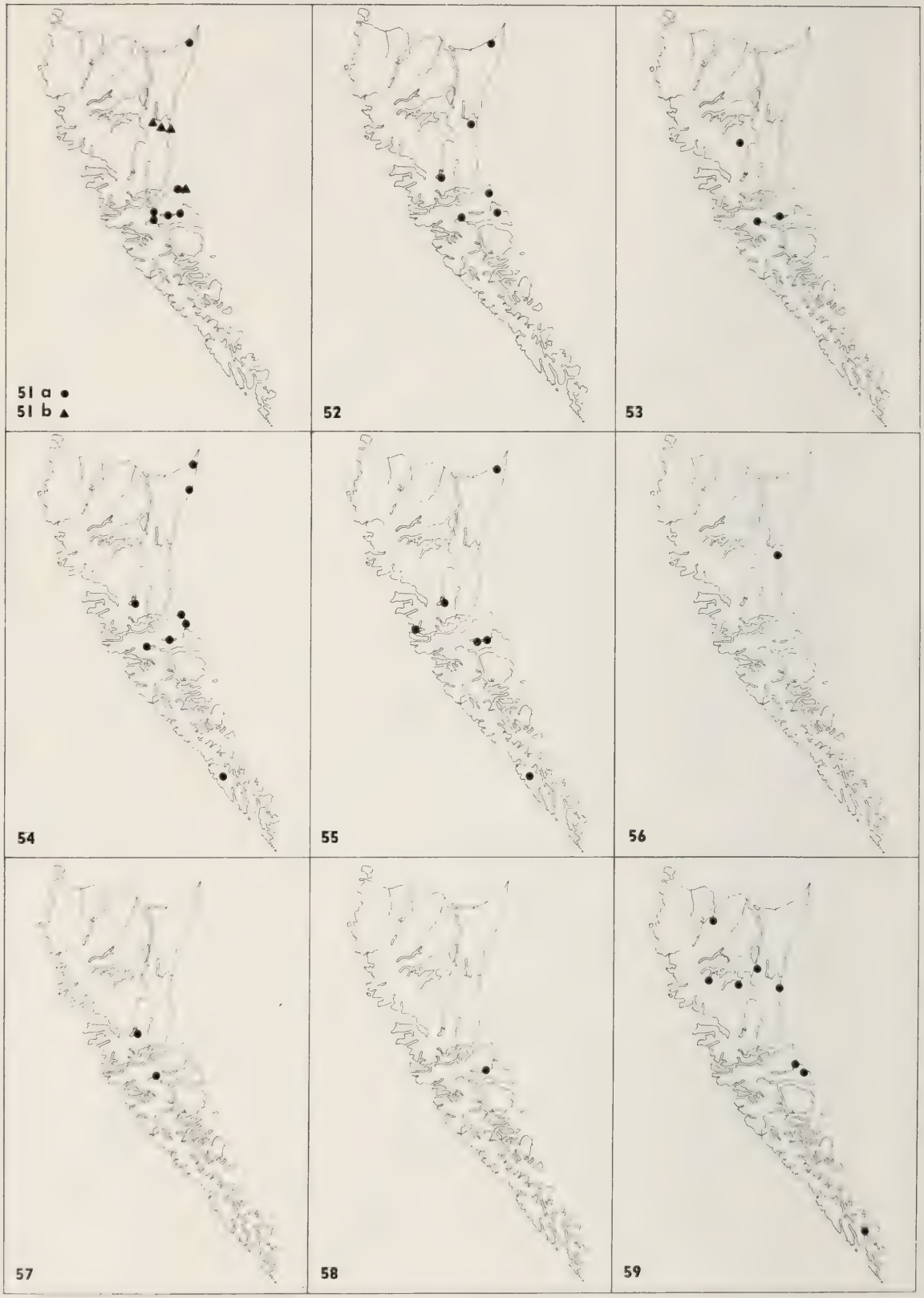
Maps 26-32c. 26. *Cryptogramma crispa* ssp. *acrostichoides*. 27. *Cystopteris fragilis*. 28. *Dryopteris austriaca*. 29. *Gymnocarpium dryopteris*. 30. *Polypodium scouleri*. 31a. *Polypodium vulgare* ssp. *occidentale;* 31b. *Polypodium vulgare* ssp. *columbianum*. 32a. *Polystichum braunii* ssp. *alaskense*. 32b. *Polystichum braunii* ssp. *andersonii*. 32c. *Polystichum braunii* ssp. *purshii*.



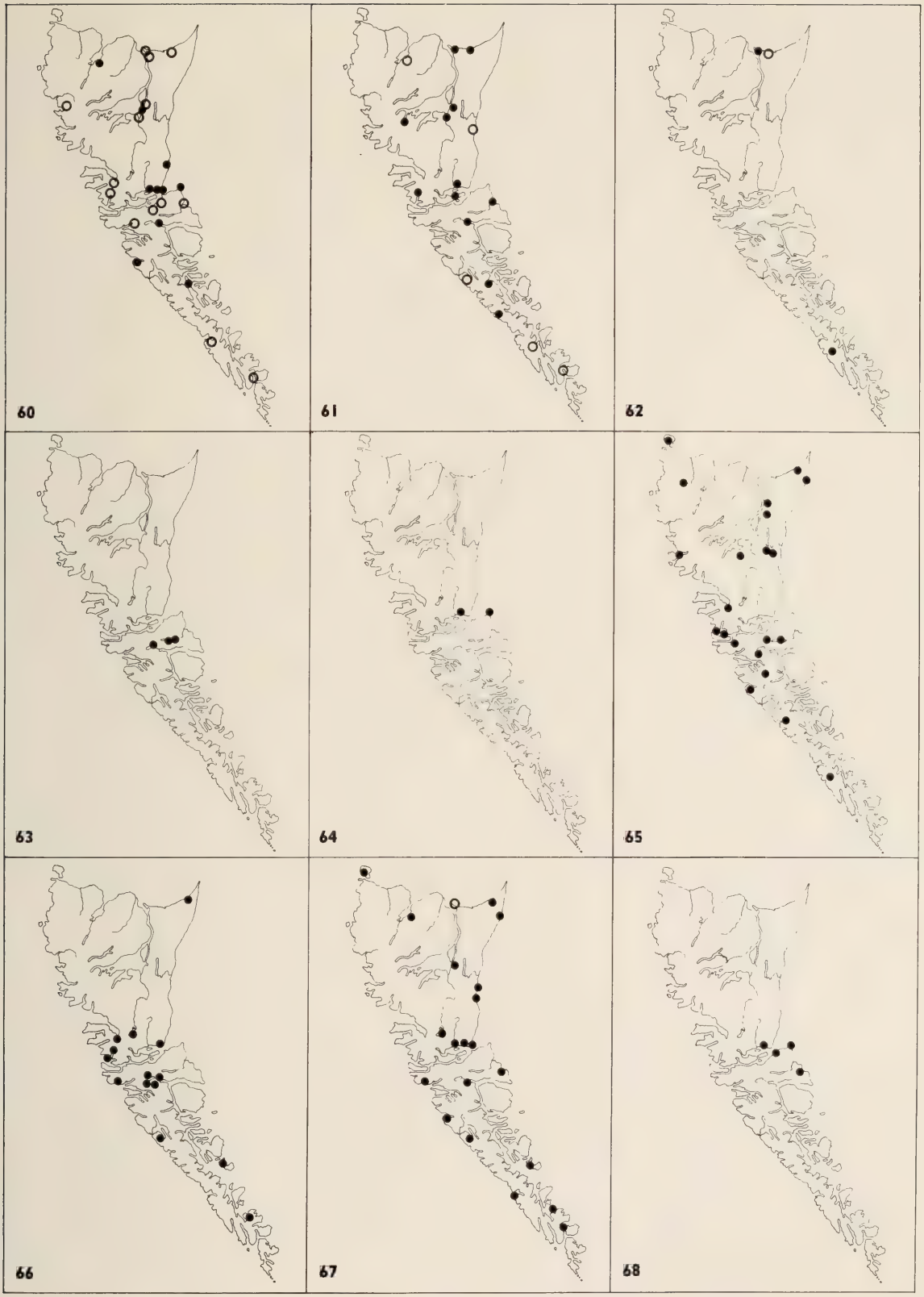
MAPS 33-41. 33. *Polystichum lonchitis*. 34. *Polystichum munitum*. 35. *Pteridium aquilinum* var. *pubescens*. 36. *Thelypteris oreopteris*. 37. *Thelypteris phegopteris*. 38. *Taxus brevifolia*. 39. *Picea sitchensis*. 40. *Pinus contorta*. 41. *Tsuga heterophylla*.



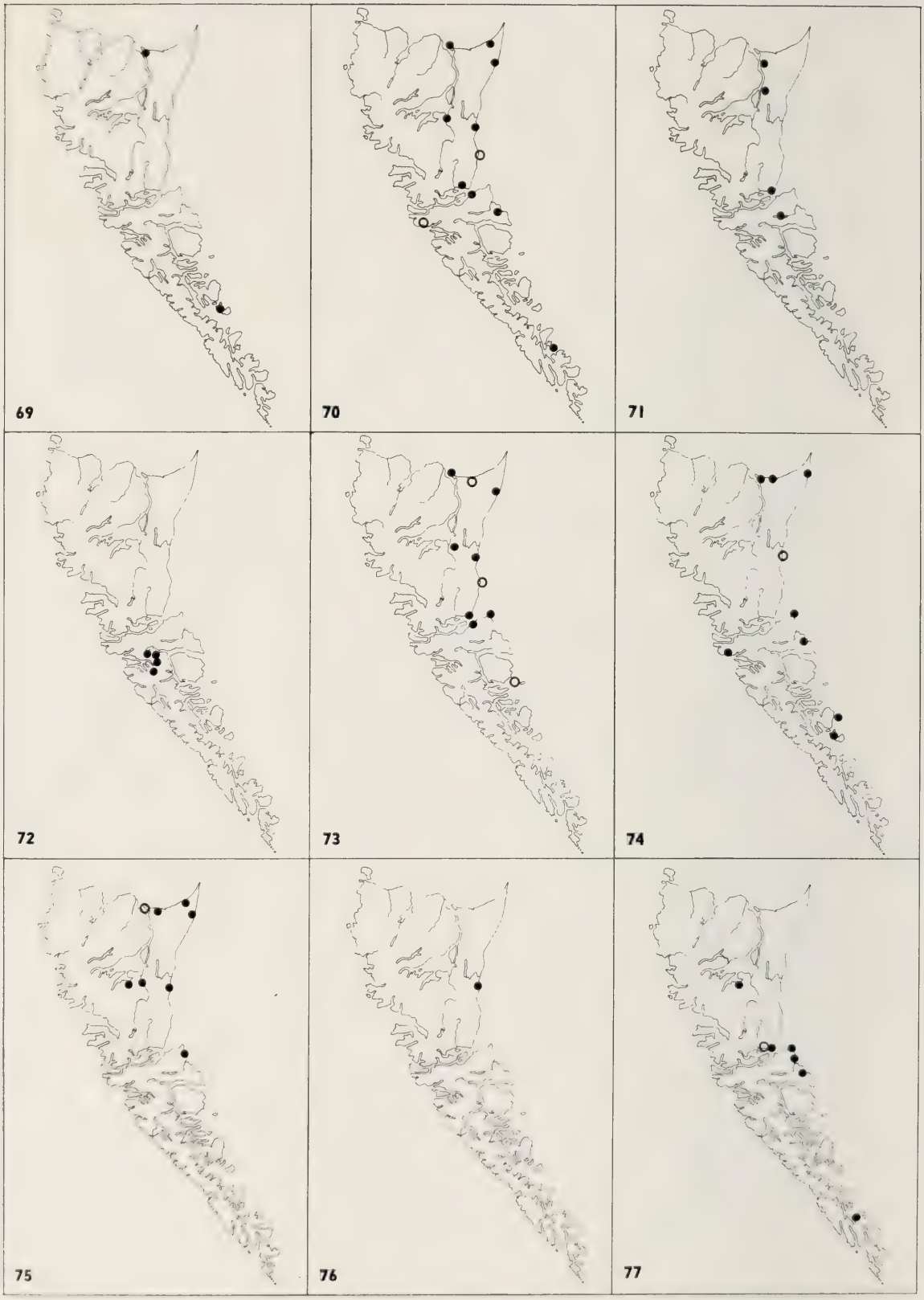
Maps 42-50. 42. *Tsuga mertensiana*. 43. *Chamaecyparis nootkatensis*. 44. *Juniperus communis*. 45. *Thuya plicata*. 46. *Sparganium hyperboreum*. 47. *Sparganium minimum*. 48. *Sparganium simplex*. 49. *Phyllospadix scouleri*. 50. *Potamogeton alpinus* ssp. *tenuifolius*.



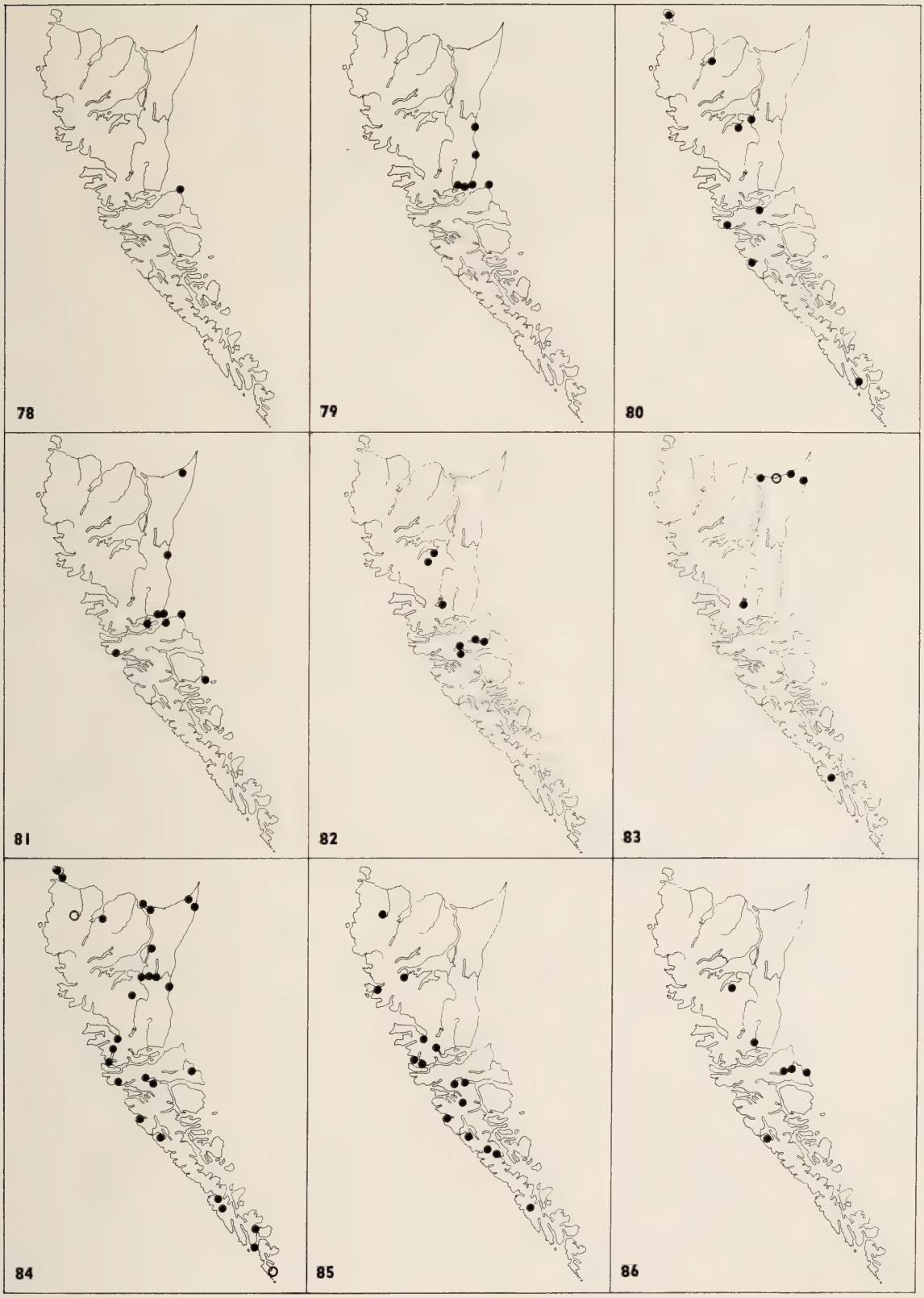
Maps 51-59. 51a. *Potamogeton berchtoldii* ssp. *berchtoldii;* 51b. *Potamogeton berchtoldii* ssp. *tenuissimus.* 52. *Potamogeton epihydrus* ssp. *nuttallii.* 53. *Potamogeton gramineus.* 54. *Potamogeton natans.* 55. *Potamogeton nodosus.* 56. *Potamogeton pectinatus.* 57. *Potamogeton richardsonii.* 58. *Potamogeton robbinsii.* 59. *Ruppia maritima.*



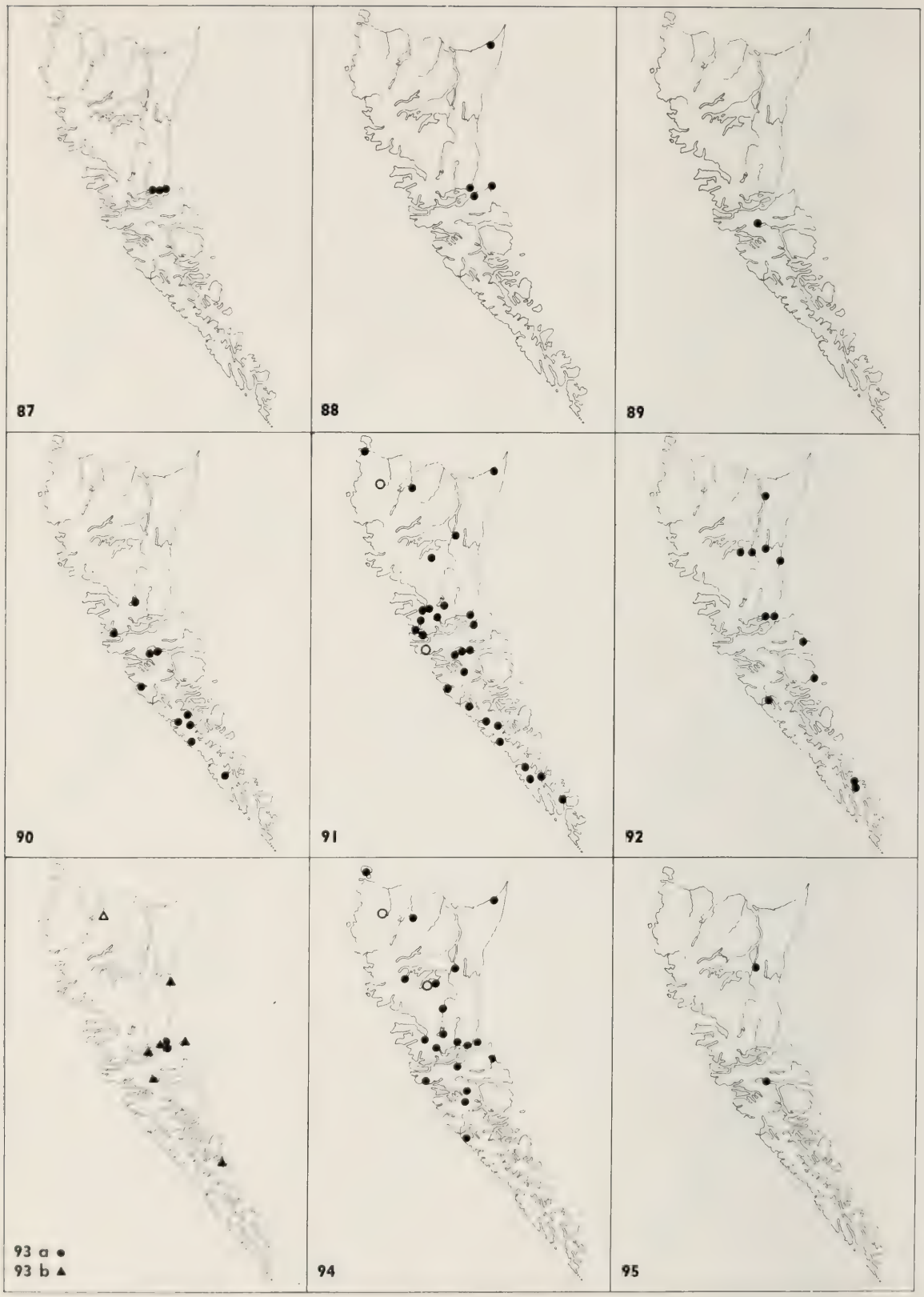
MAPS 60-68. 60. *Zostera marina*. 61. *Triglochin maritimum*. 62. *Triglochin palustre*. 63. *Elodea canadensis*. 64. *Agropyron repens*. 65. *Agrostis aequivalis*. 66. *Agrostis borealis*. 67. *Agrostis exarata*. 68. *Agrostis gigantea*.



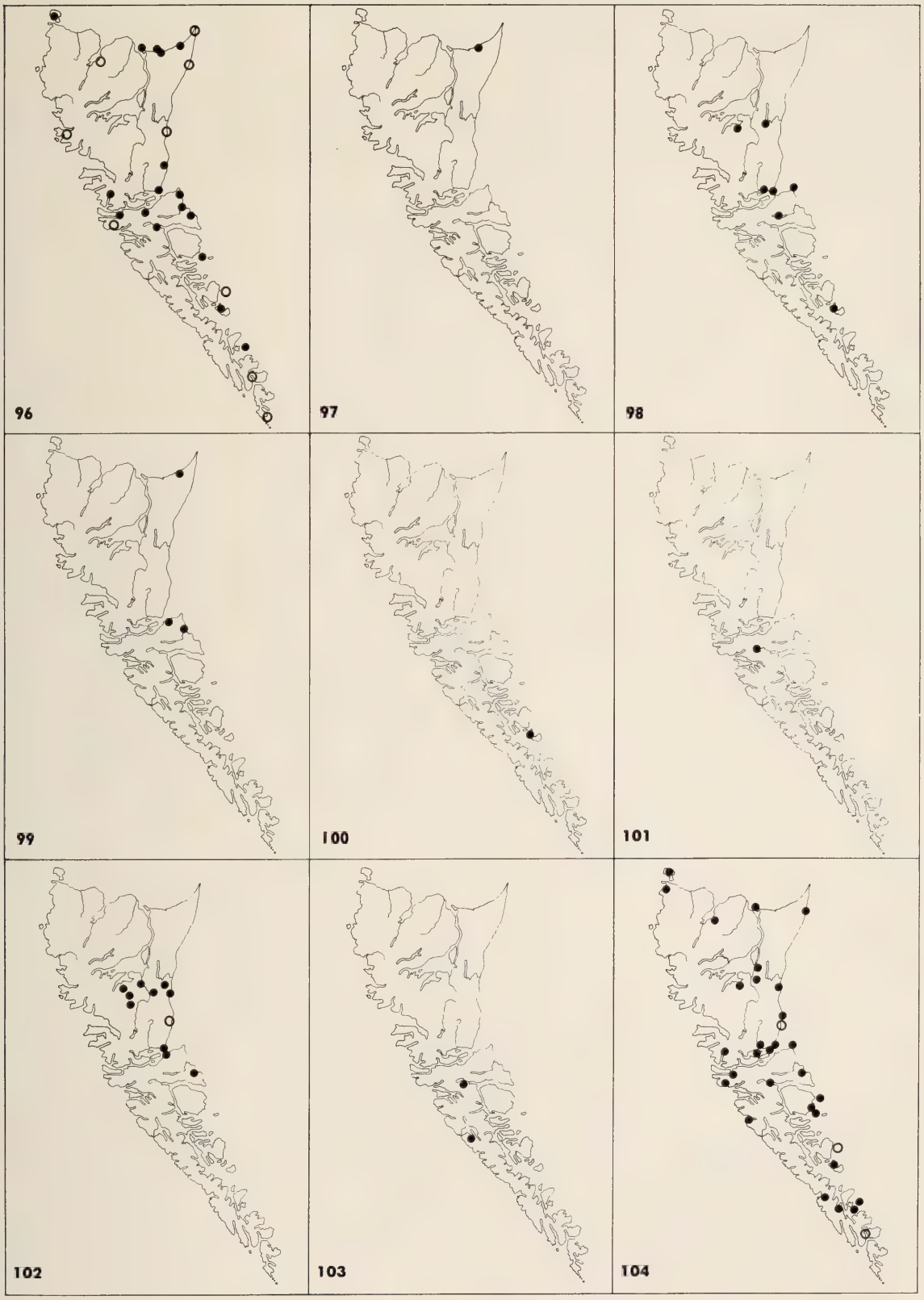
MAPS 69-77. 69. *Agrostis pallens.* 70. *Agrostis palustris.* 71. *Agrostis scabra.* 72. *Agrostis thurberiana.* 73. *Aira caryophyllea.* 74. *Aira praecox.* 75. *Alopecurus geniculatus.* 76. *Ammophila arenaria.* 77. *Anthoxanthum odoratum.*



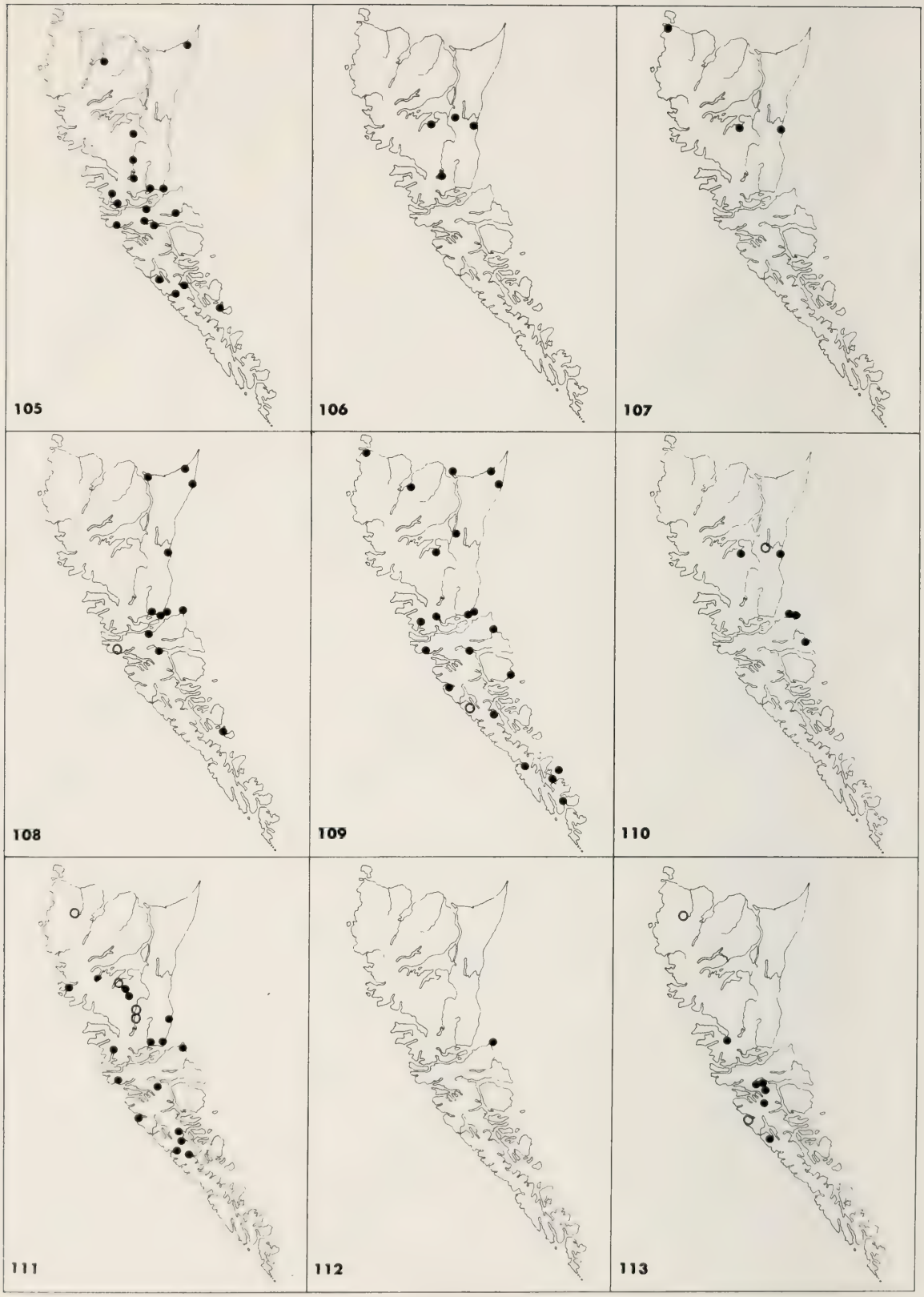
Maps 78-86. 78. *Avena fatua*. 79. *Bromus mollis*. 80. *Bromus pacificus*. 81. *Bromus sitchensis*. 82. *Calamagrostis canadensis*. 83. *Calamagrostis crassiglumis*. 84. *Calamagrostis nutkaensis*. 85. *Calamagrostis purpurascens* ssp. *tasuensis*. 86. *Cinna latifolia*.



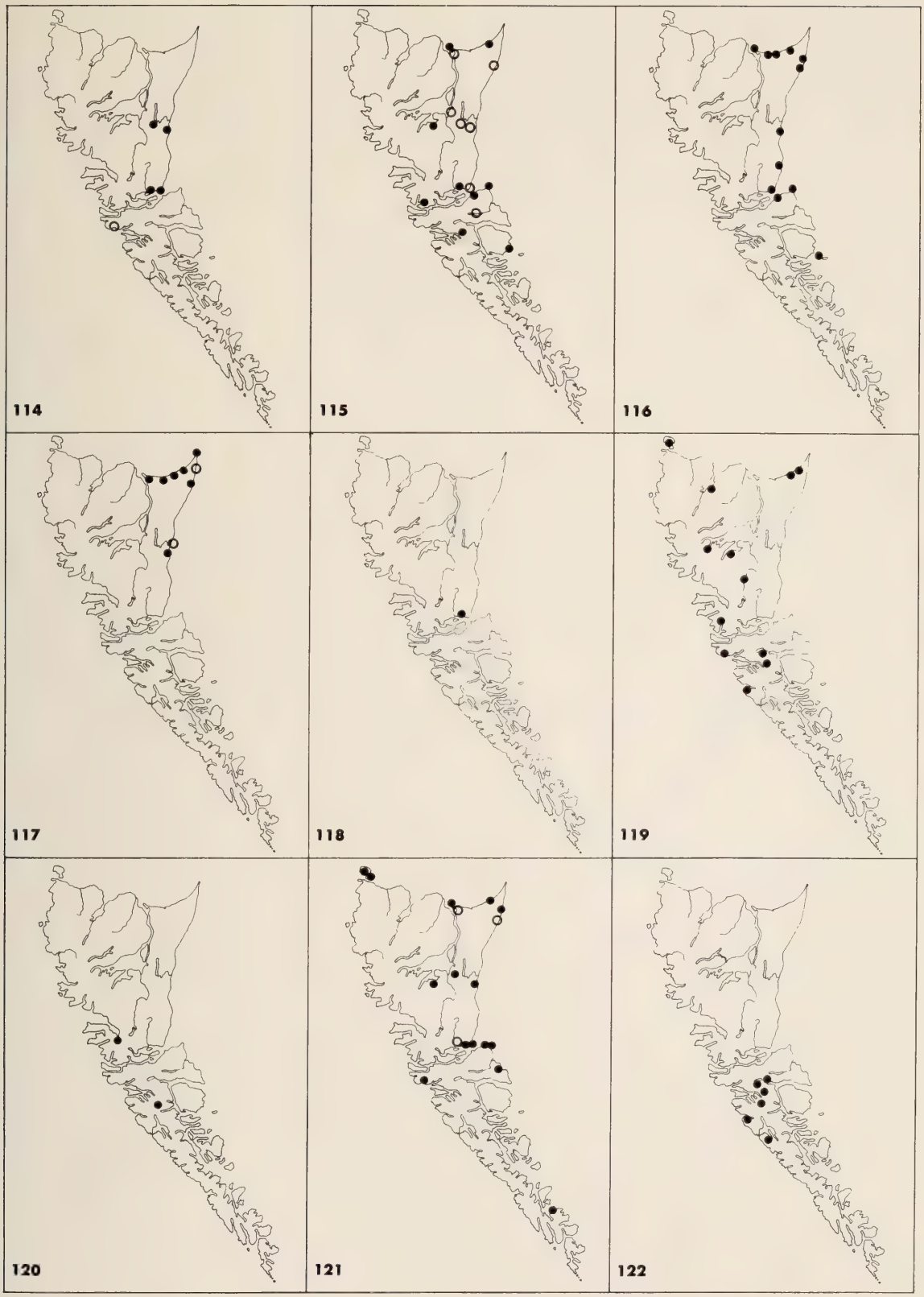
MAPS 87-95. 87. *Cynosurus aristatus.* 88. *Dactylis glomerata.* 89. *Danthonia californica.* 90. *Danthonia intermedia.* 91. *Deschampsia caespitosa* ssp. *beringensis.* 92. *Deschampsia elongata.* 93a. *Elymus glaucus* ssp. *glaucus;* 93b. *Elymus glaucus* ssp. *virescens.* 94. *Elymus hirsutus.* 95. *Elymus hirsutus* × *Hordeum brachyantherum.*



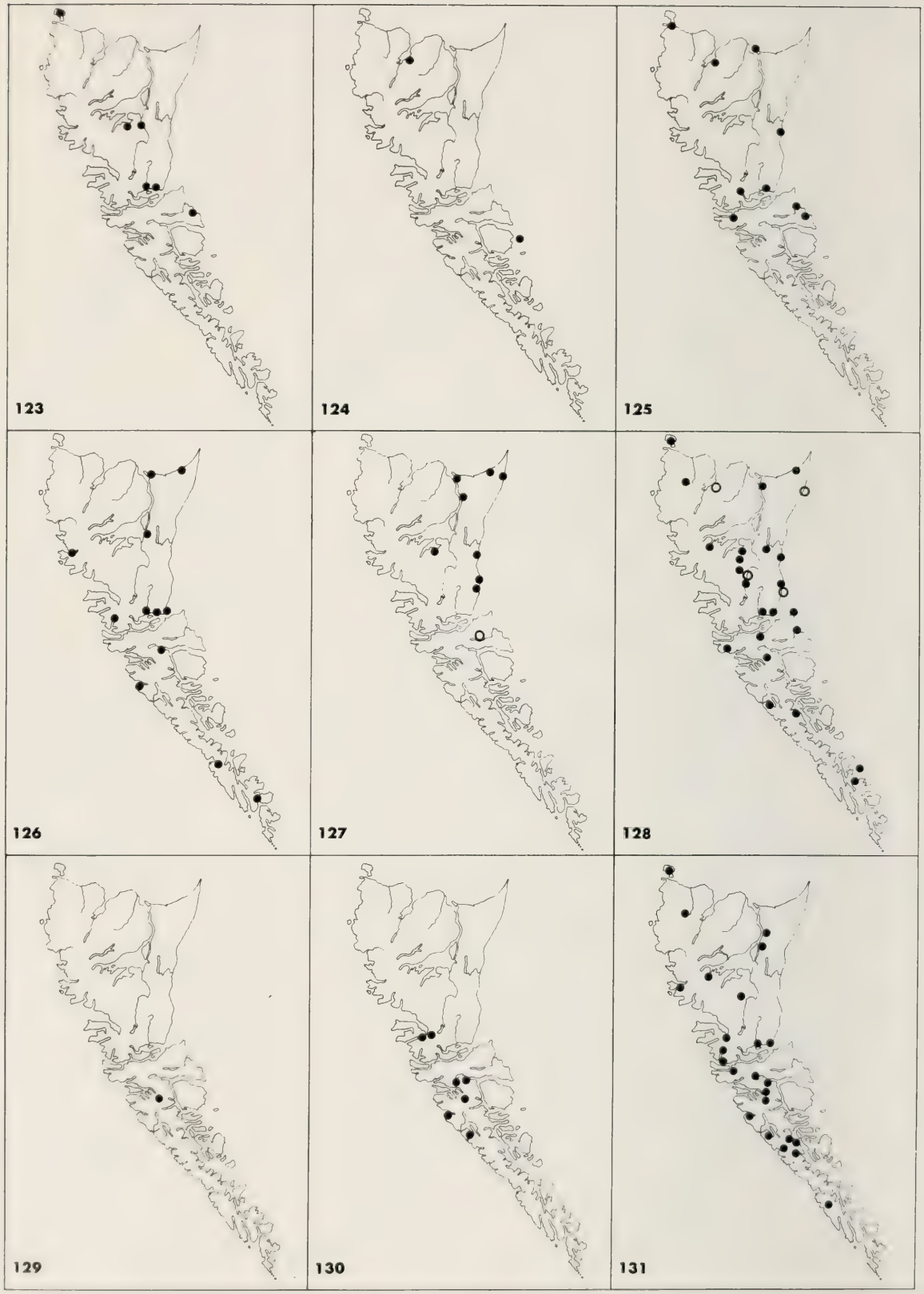
Maps 96-104. 96. *Elymus mollis*. 97. *Festuca arundinacea*. 98. *Festuca dertonensis*. 99. *Festuca elatior*. 100. *Festuca megalura*. 101. *Festuca myuros*. 102. *Festuca occidentalis*. 103. *Festuca prolifera*. 104. *Festuca rubra*.



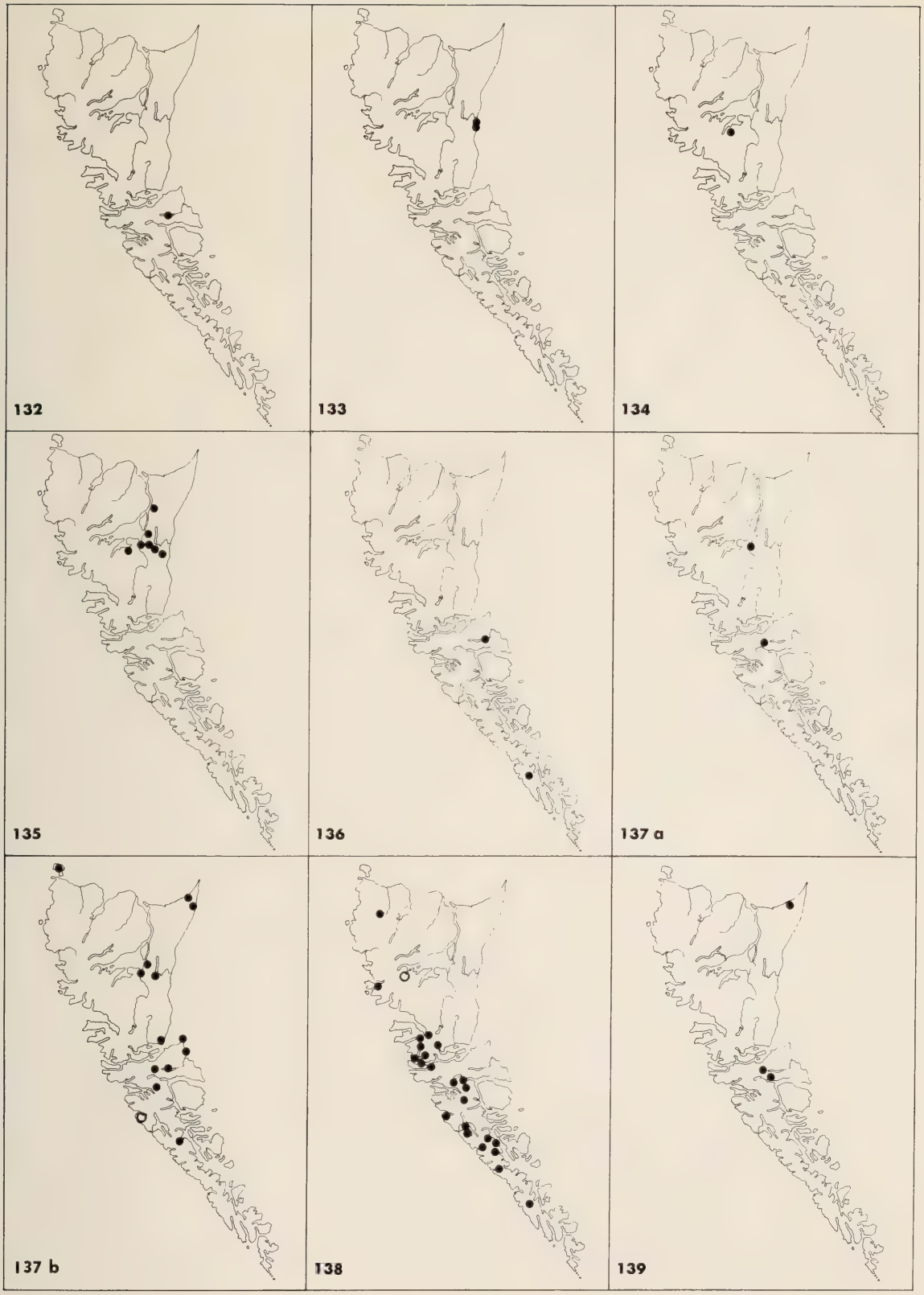
Maps 105-113. 105. *Festuca subulata*. 106. *Glyceria occidentalis*. 107. *Hierochloë odorata*. 108. *Holcus lanatus*. 109. *Hordeum brachyantherum*. 110. *Lolium perenne*. 111. *Melica subulata*. 112. *Phalaris arundinacea*. 113. *Phleum alpinum*.



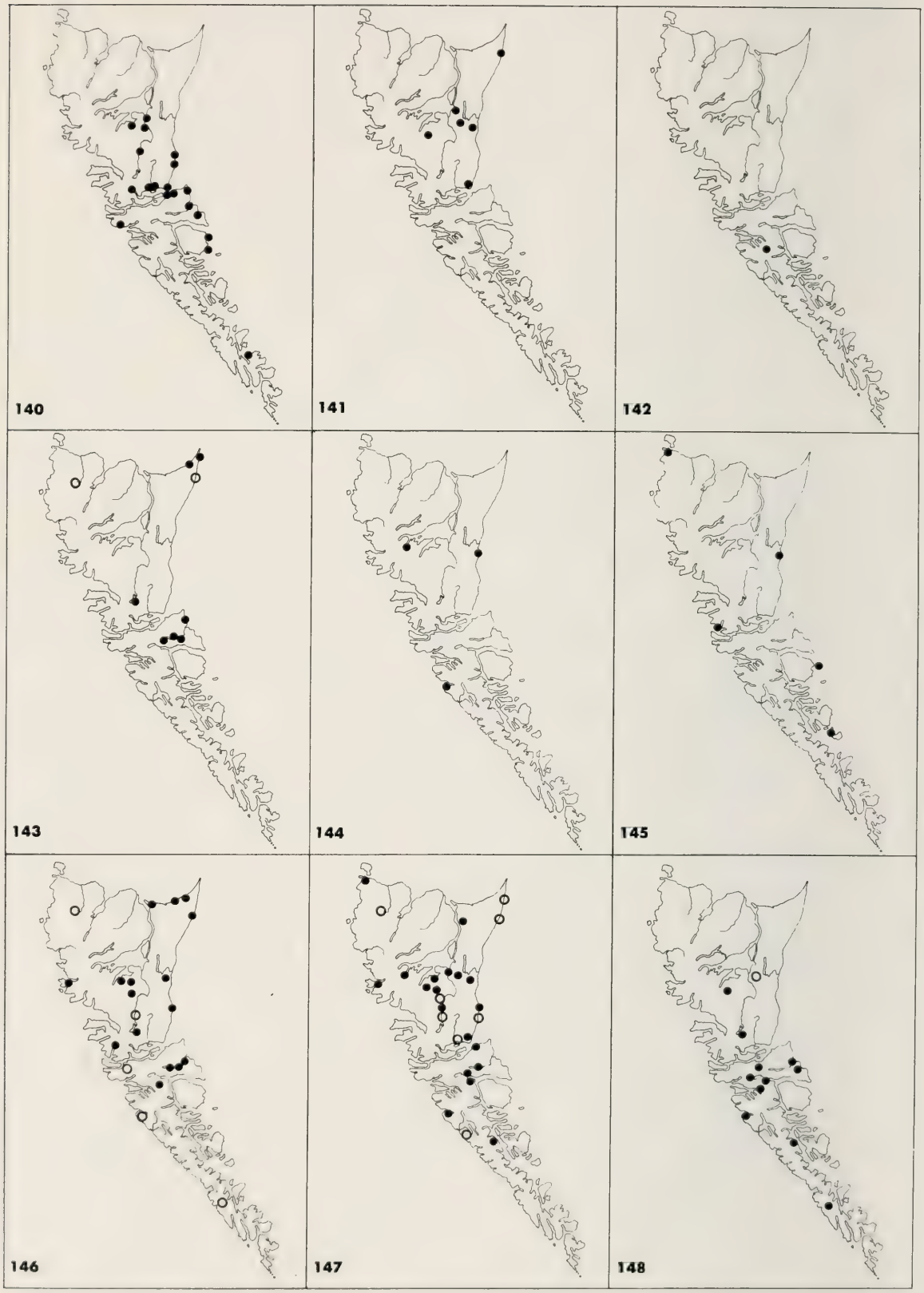
Maps 114-122. 114. *Phleum pratense*. 115. *Poa annua*. 116. *Poa confinis*. 117. *Poa douglasii* ssp. *macrantha*. 118. *Poa interior*. 119. *Poa laxiflora*. 120. *Poa leptocoma*. 121. *Poa pratensis*. 122. *Poa stenantha*.



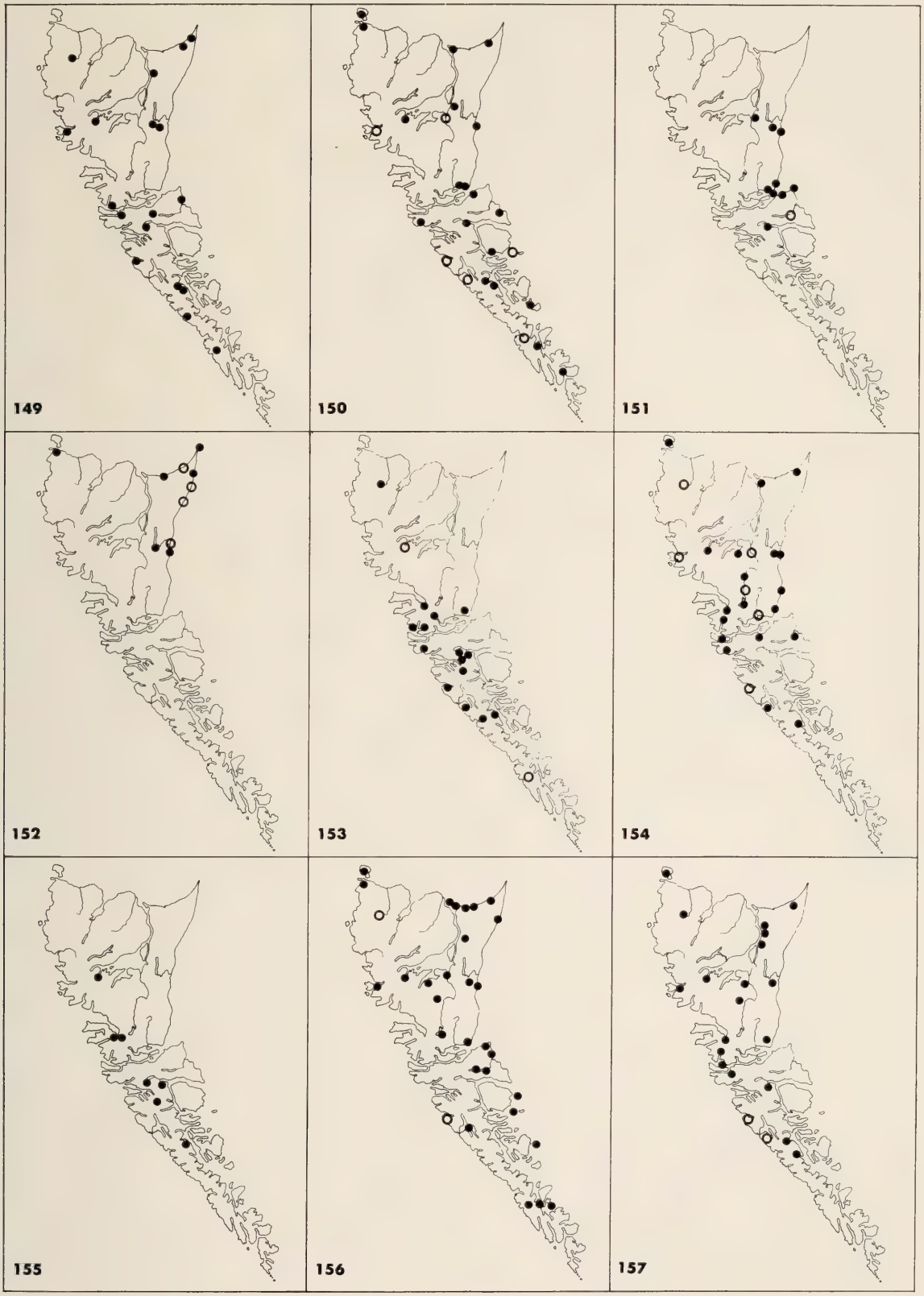
MAPS 123-131. 123. *Poa trivialis*. 124. *Puccinellia borealis*. 125. *Puccinellia nutkaensis*. 126. *Puccinellia pumila*. 127. *Torreyochloa pauciflora*. 128. *Trisetum cernuum*. 129. *Trisetum spicatum*. 130. *Vahlodea atropurpurea* ssp. *paramushirensis*. 131. *Carex anthoxanthea*.



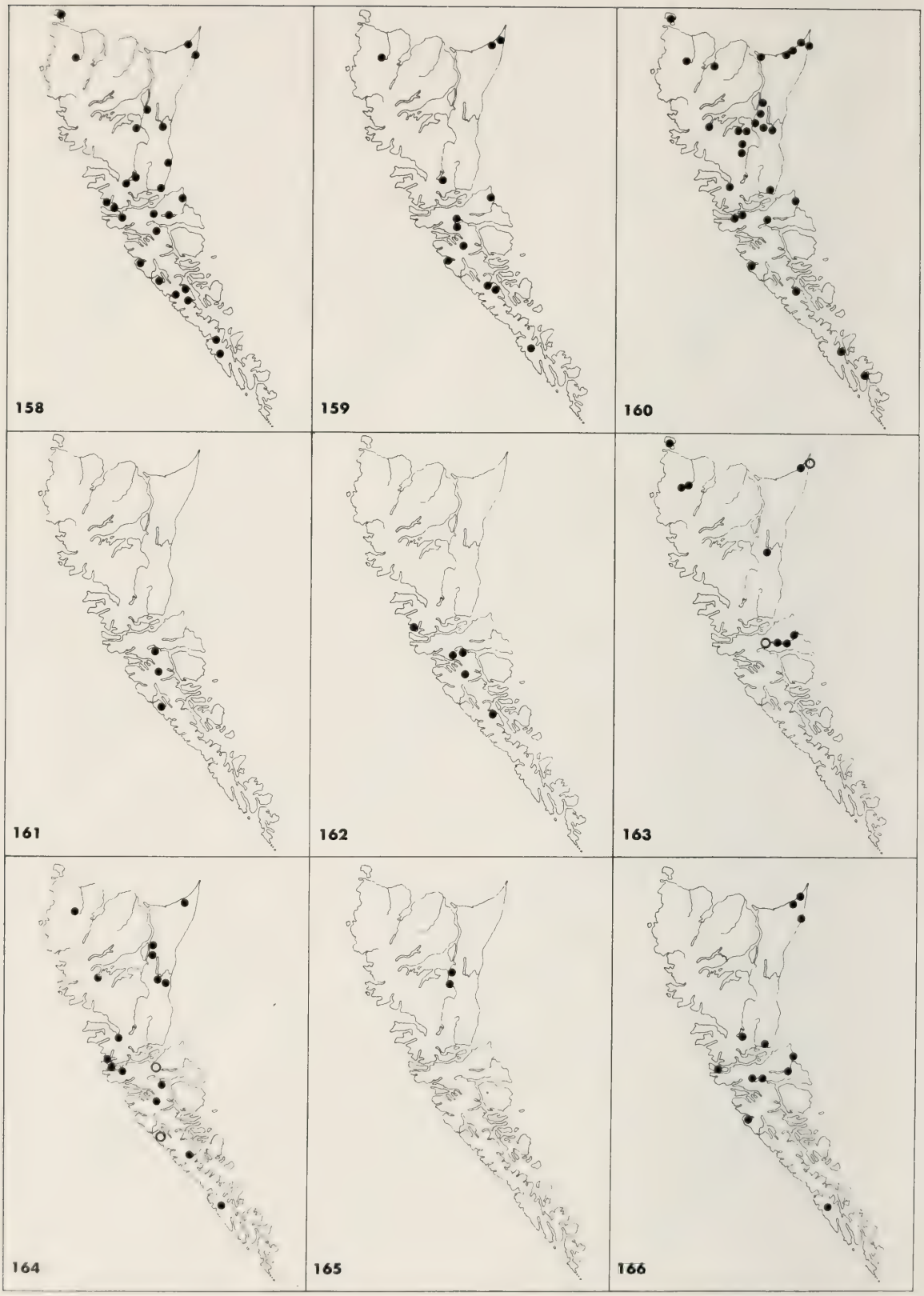
Maps 132-139. 132. *Carex arcta*. 133. *Carex arenicola* ssp. *pansa*. 134. *Carex brevicaulis*. 135. *Carex brunnescens*. 136. *Carex buxbaumii*. 137a. *Carex canescens* ssp. *canescens;* 137b. *Carex canescens* ssp. *arctaeformis*. 138. *Carex circinata*. 139. *Carex cusickii*.



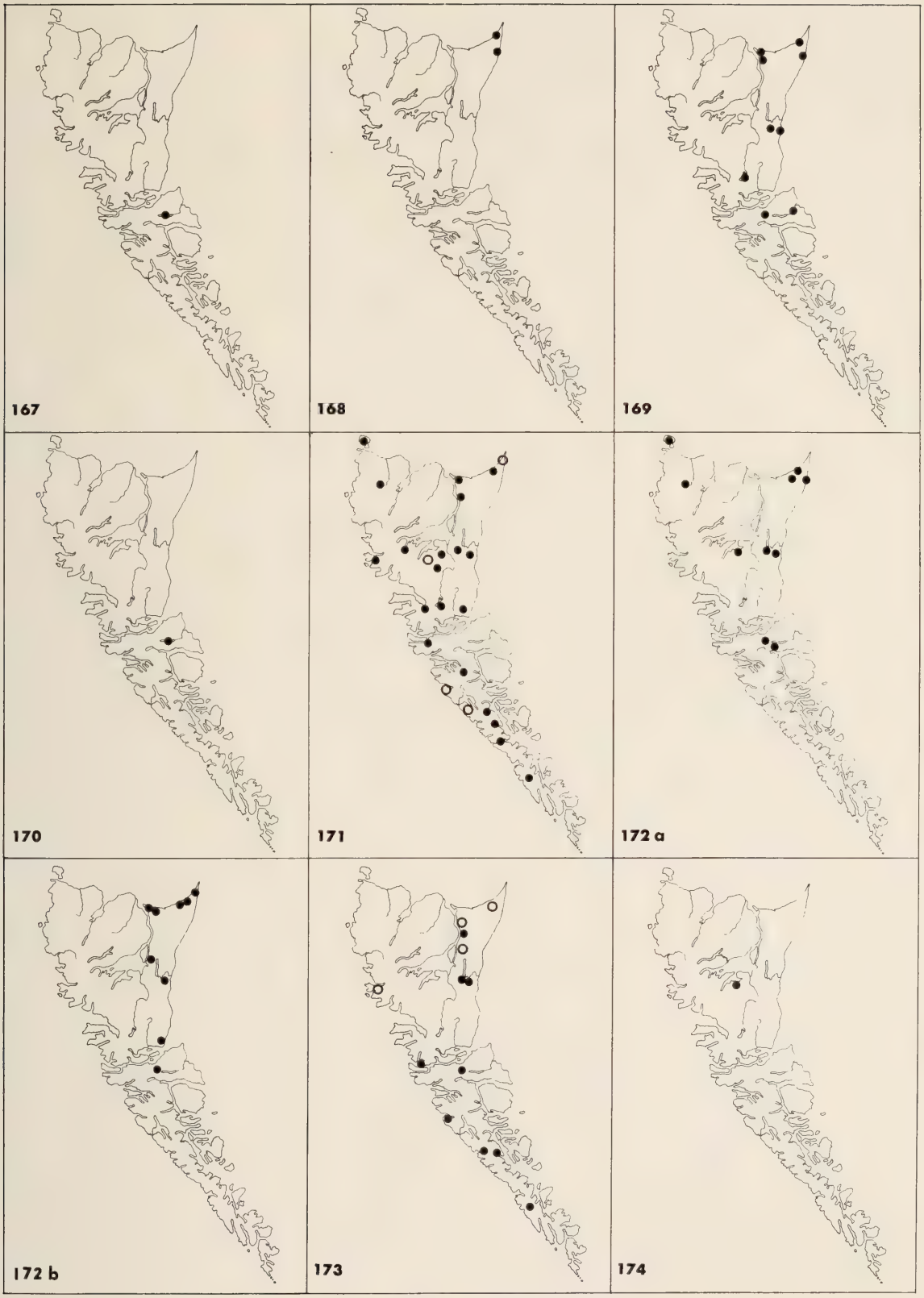
Maps 140-148. 140. *Carex deweyana* ssp. *leptopoda*. 141. *Carex disperma*. 142. *Carex enanderi*. 143. *Carex exsiccata*. 144. *Carex glareosa*. 145. *Carex gmelinii*. 146. *Carex kelloggii*. 147. *Carex laeviculmis*. 148. *Carex leptalea* ssp. *pacifica*.



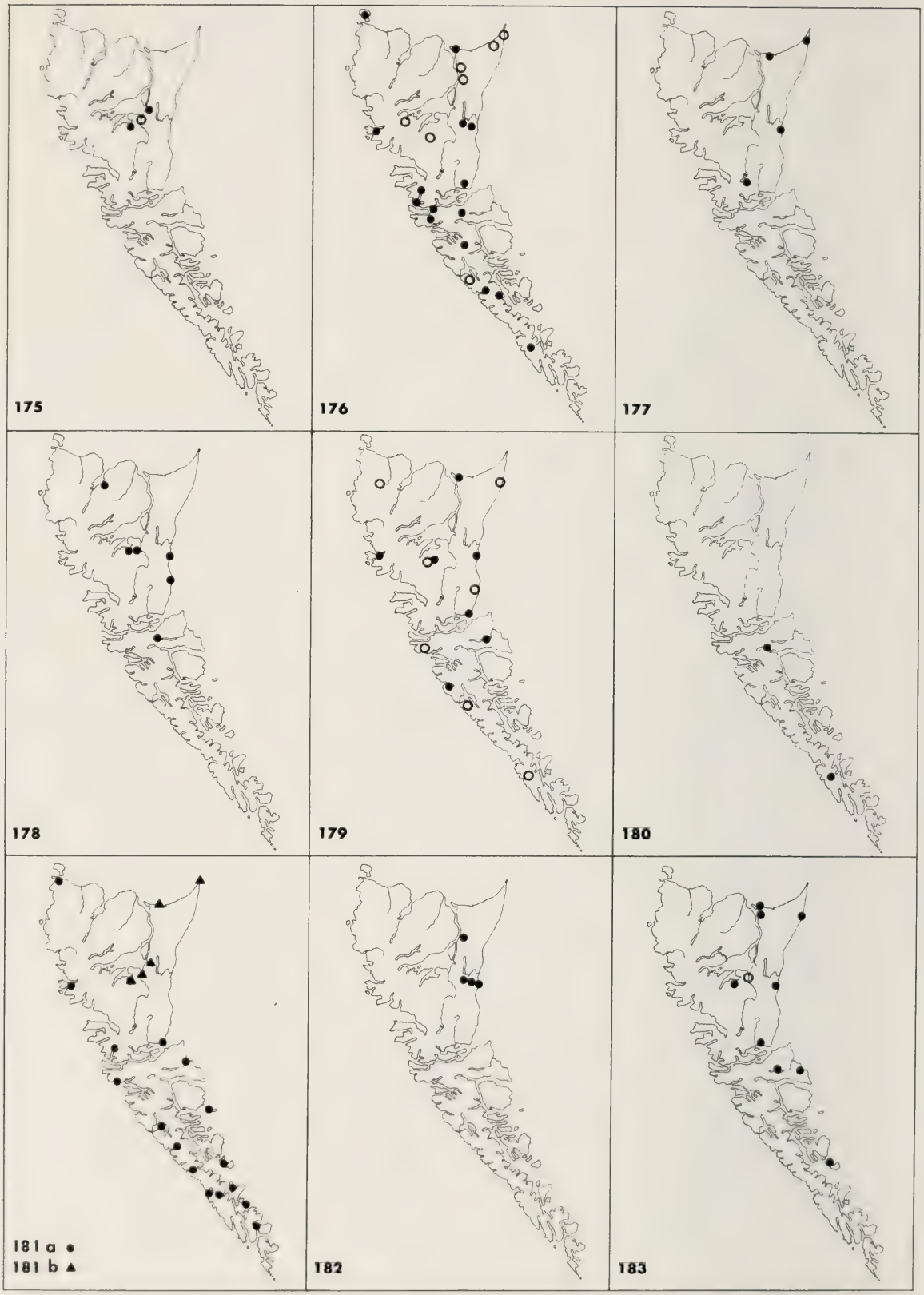
Maps 149-157. 149. *Carex livida*. 150. *Carex lyngbyei*. 151. *Carex macloviana* ssp. *pachystachya*. 152. *Carex macrocephala*. 153. *Carex macrochaeta*. 154. *Carex mertensii*. 155. *Carex nigricans*. 156. *Carex obnupta*. 157. *Carex pauciflora*.



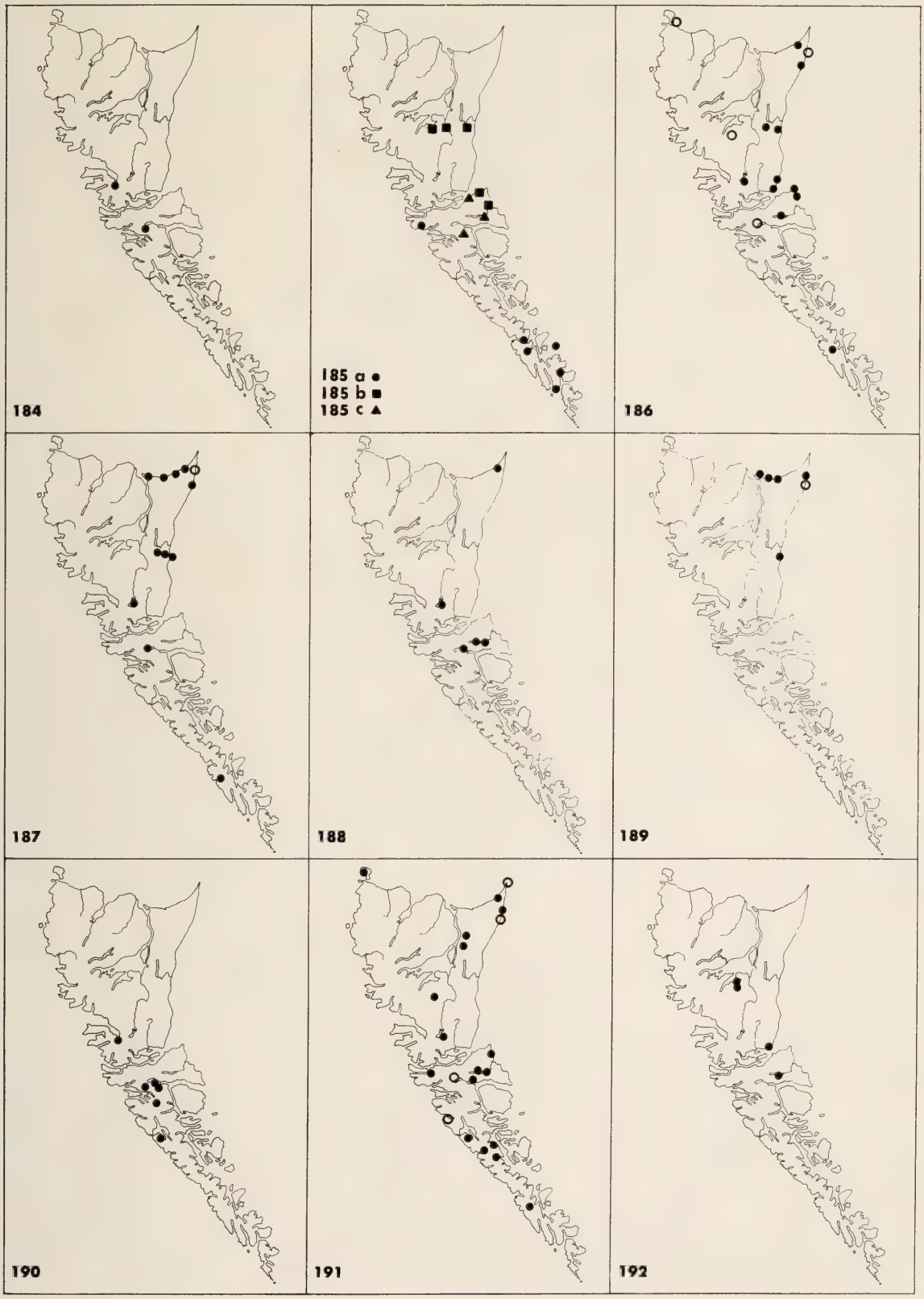
MAPS 158-166. 158. *Carex phyllomanica*. 159. *Carex physocarpa*. 160. *Carex pluriflora*. 161. *Carex pyrenaica* ssp. *micropoda*. 162. *Carex scirpoidea*. 163. *Carex sitchensis*. 164. *Carex stylosa*. 165. *Carex tracyi*. 166. *Carex viridula*.



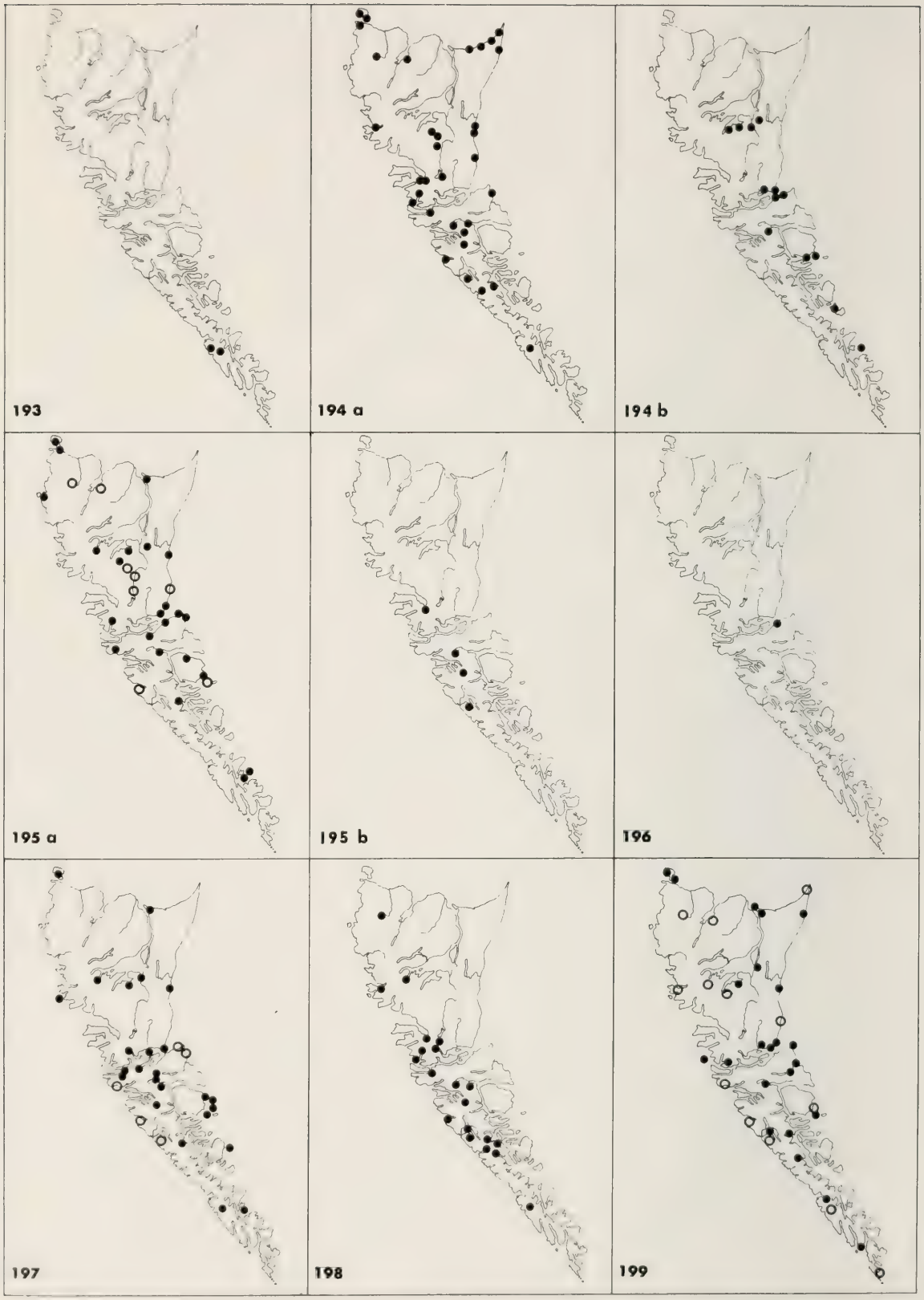
MAPS 167-174. 167. *Eleocharis acicularis*. 168. *Eleocharis kamtschatica*. 169. *Eleocharis macrostachya*. 170. *Eleocharis obtusa*. 171. *Eriophorum angustifolium*. 172a. *Eriophorum chamissonis;* 172b. *Eriophorum chamissonis* × *E. russeolum*. 173. *Rhynchospora alba*. 174. *Scirpus atrocinctus*.



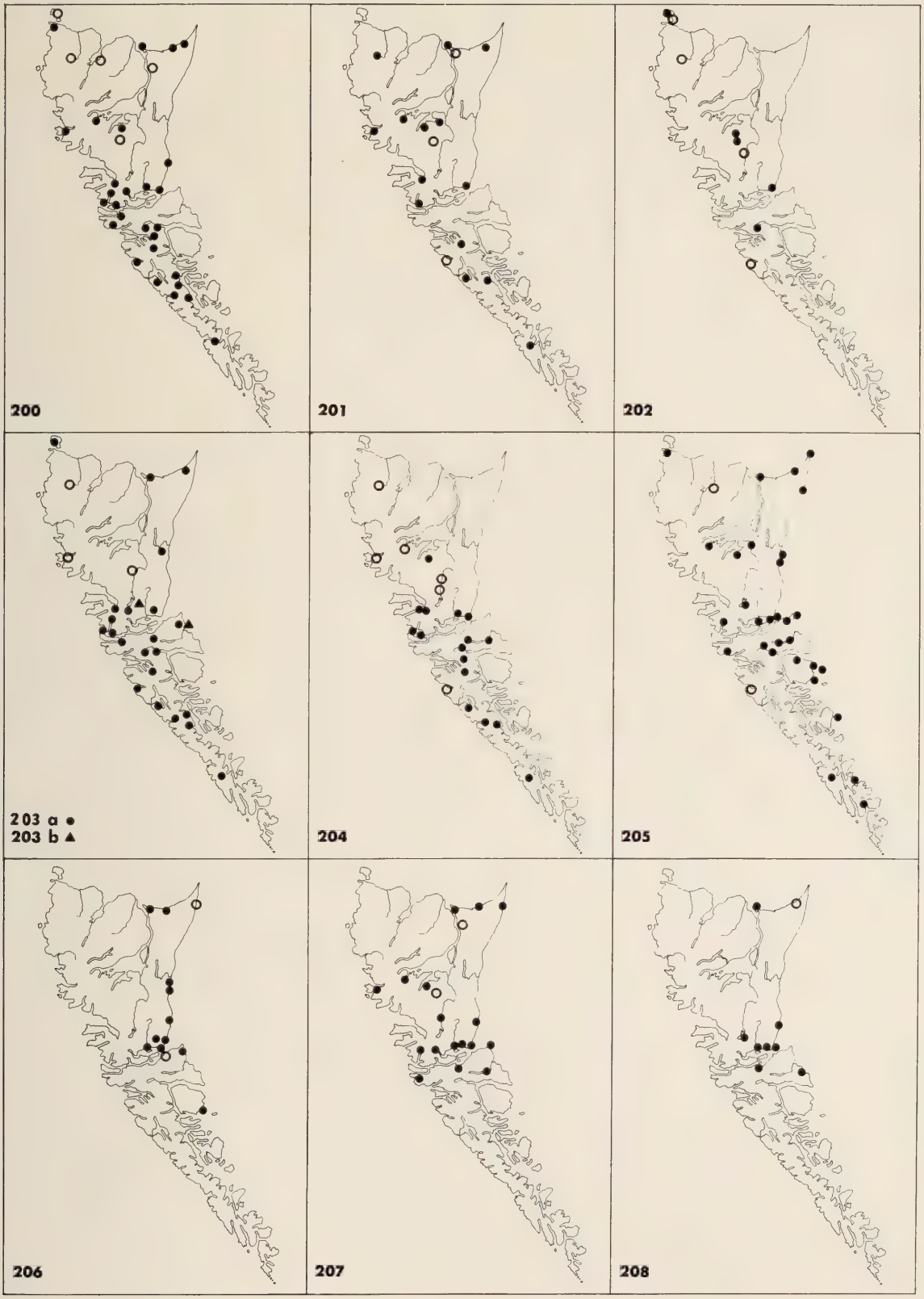
MAPS 175-183. 175. *Scirpus cernuus.* 176. *Scirpus cespitosus.* 177. *Scirpus lacustris* ssp. *glaucus.* 178. *Scirpus sylvaticus* ssp. *digynus.* 179. *Lysichton americanum.* 180. *Juncus alpinus* ssp. *nodulosos.* 181a. *Juncus arcticus* ssp. *sitchensis;* 181b. *Juncus arcticus* ssp. *ater.* 182. *Juncus articulatus.* 183. *Juncus bufonius.*



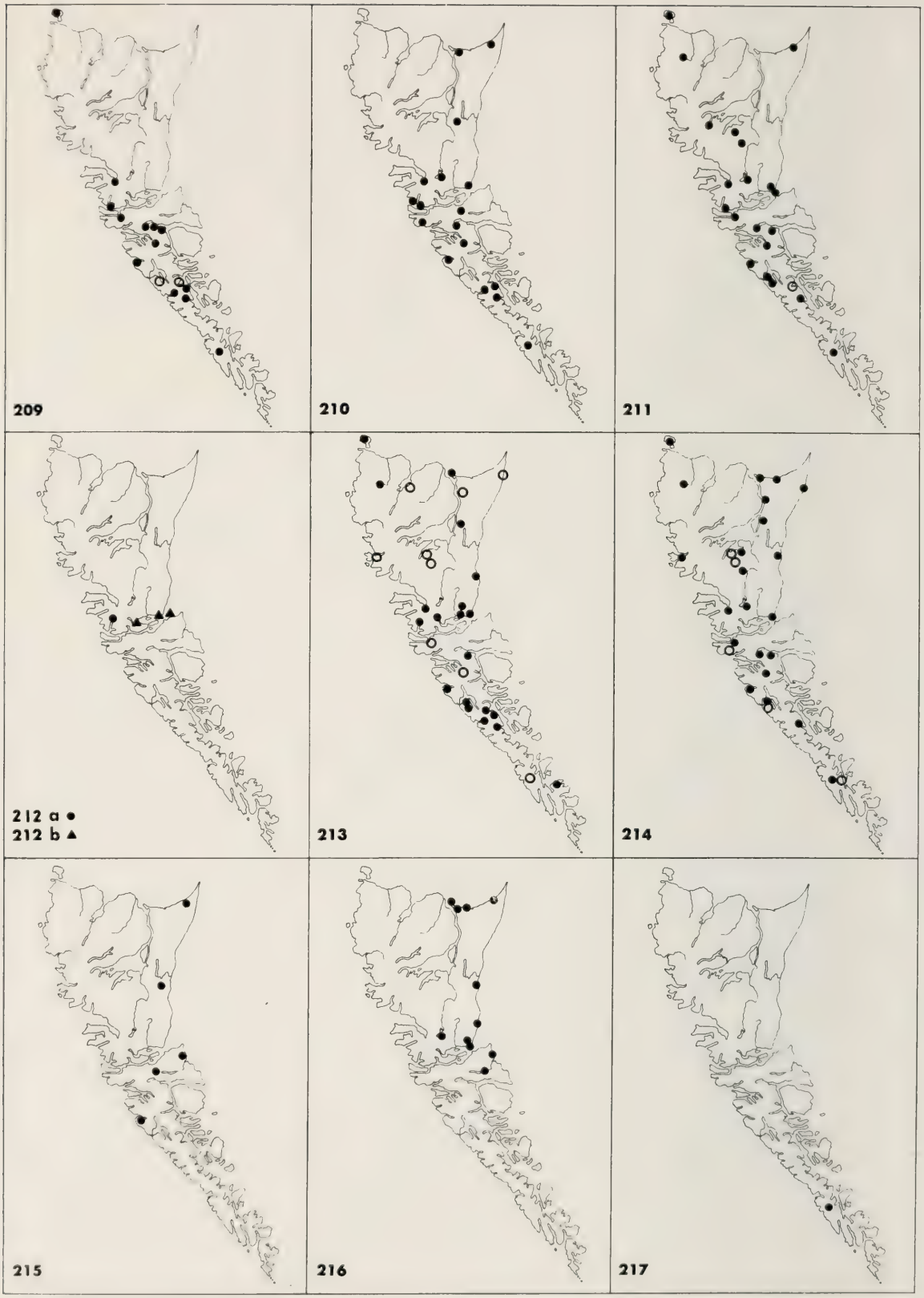
Maps 184-192. 184. *Juncus drummondii.* 185a. *Juncus effusus* var. *brunneus;* 185b. *Juncus effusus* var. *gracilis;* 185c. *Juncus effusus* var. *pacifica.* 186. *Juncus ensifolius.* 187. *Juncus falcatus.* 188. *Juncus filiformis.* 189. *Juncus leseurii.* 190. *Juncus mertensianus.* 191. *Juncus oreganus.* 192. *Juncus tenuis.*



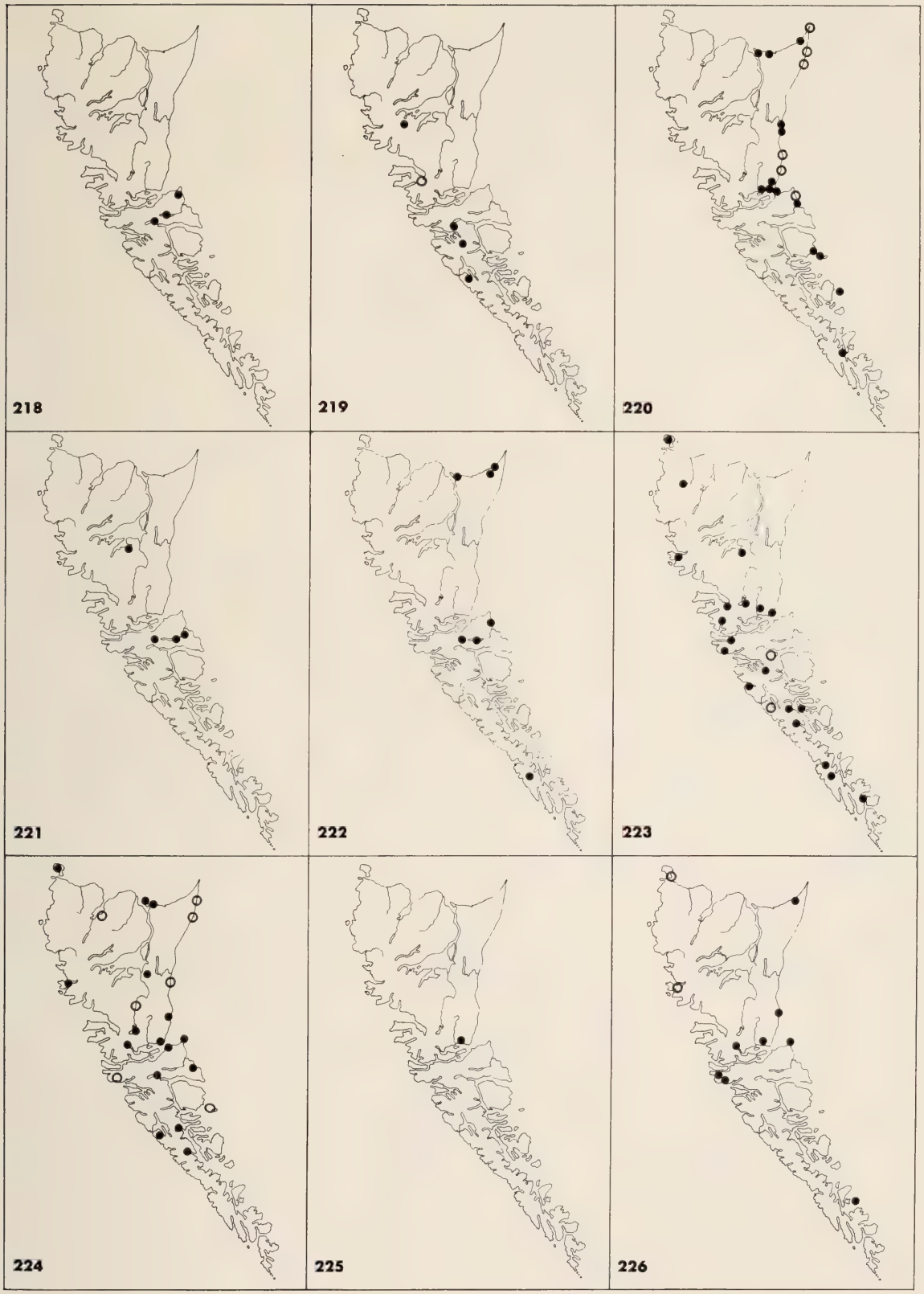
MAPS 193-199. 193. *Juncus triglumis*. 194a. *Luzula multiflora*. 194b. *Luzula multiflora* ssp. *comosa*. 195a. *Luzula parviflora* (Lowland phase). 195b. *Luzula parviflora* (Alpine phase). 196. *Allium schoenoprasum*. 197. *Fritillaria camschatcensis*. 198. *Lloydia serotina* ssp. *flava*. 199. *Maianthemum dilatatum*.



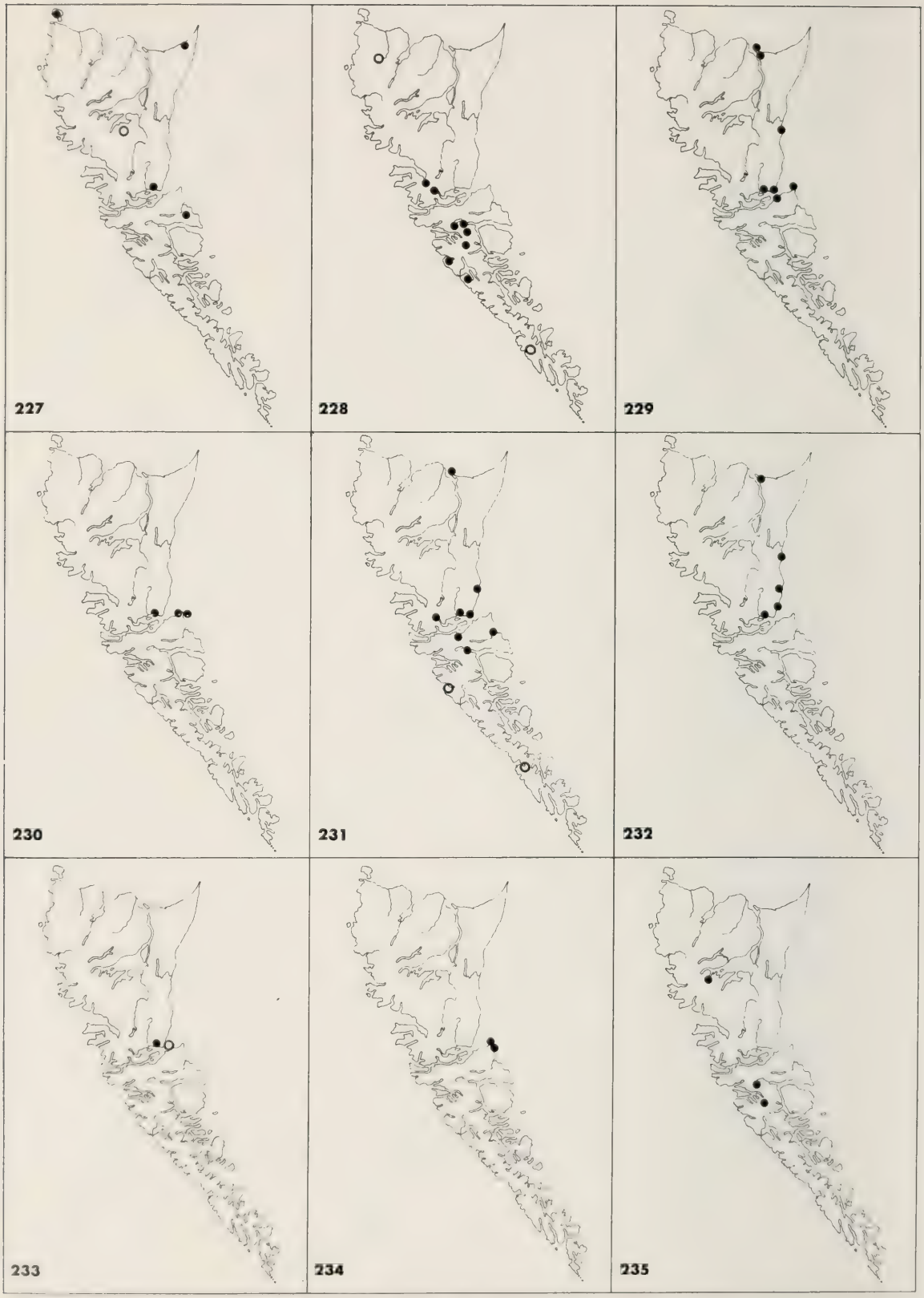
Maps 200-208. 200. *Streptopus amplexifolius*. 201. *Streptopus roseus* ssp. *curvipes*. 202. *Streptopus streptopoides* ssp. *brevipes*. 203a. *Tofieldia glutinosa* ssp. *glutinosa;* 203b. *Tofieldia glutinosa* ssp. *brevistyla*. 204. *Veratrum eschscholtzii*. 205. *Sisyrinchium littorale*. 206. *Calypso bulbosa* ssp. *occidentalis*. 207. *Corallorhiza maculata* ssp. *mertensiana*. 208. *Goodyera oblongifolia*.



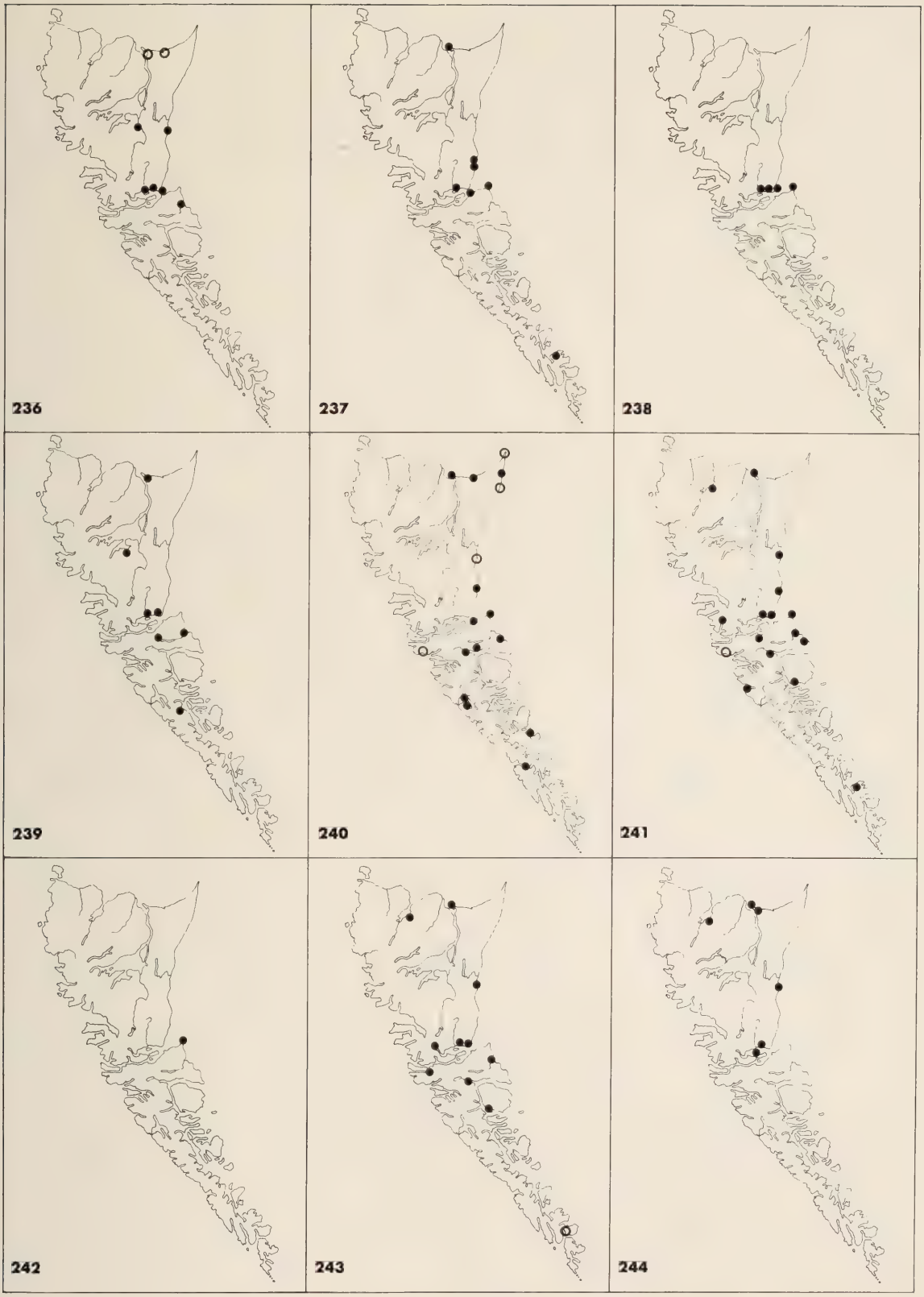
MAPS 209-217. 209. *Habenaria chorisiana.* 210. *Habenaria dilatata.* 211. *Habenaria saccata.* 212a. *Habenaria unalascensis* ssp. *unalascensis;* 212b. *Habenaria unalascensis* ssp. *maritima.* 213. *Listera caurina.* 214. *Listera cordata.* 215. *Malaxis paludosa.* 216. *Spiranthes romanzoffiana.* 217. *Salix hookeriana.*



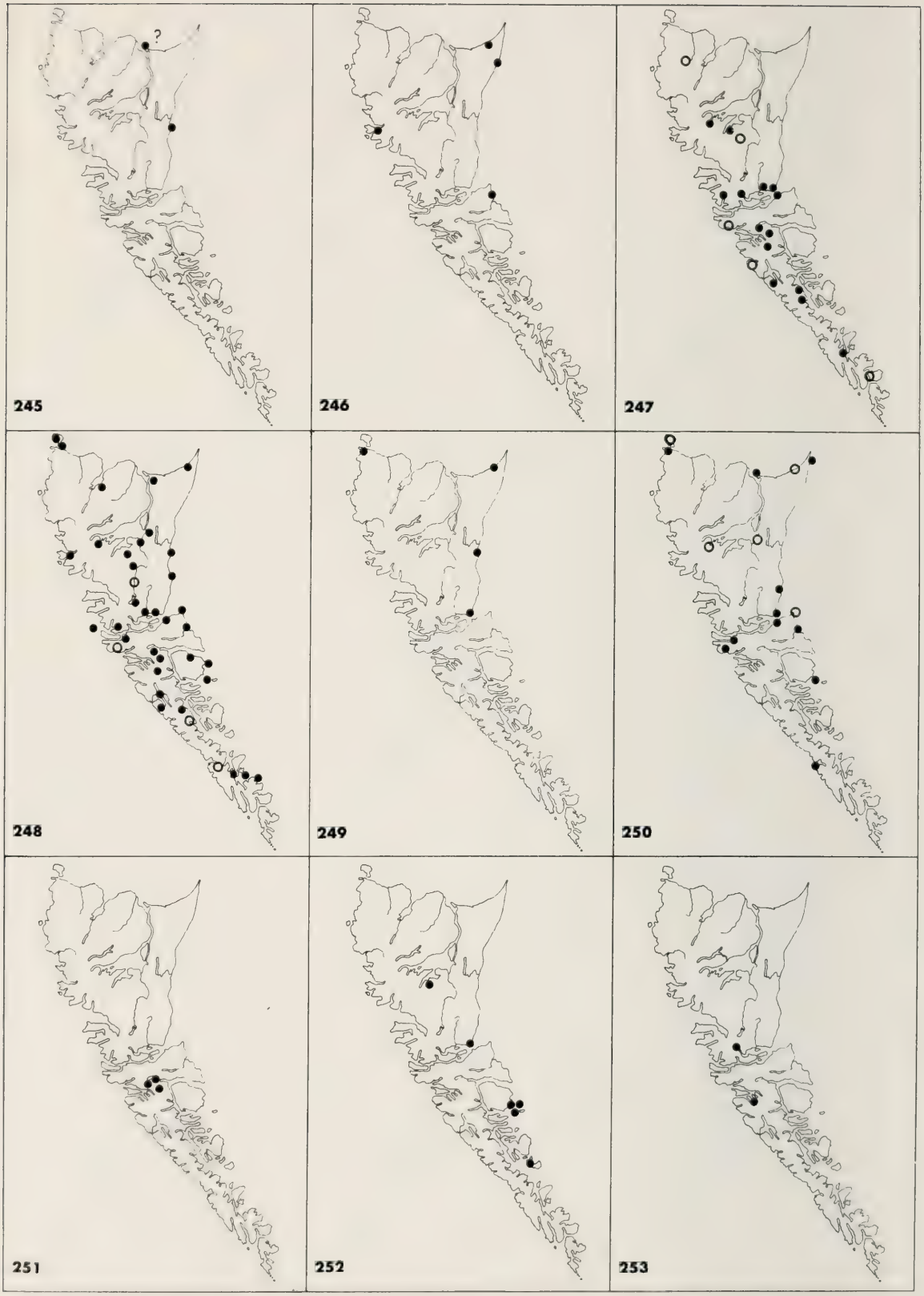
Maps 218-226. 218. *Salix lasiandra*. 219. *Salix reticulata* ssp. *glabellicarpa*. 220. *Salix scouleriana*. 221. *Salix sitchensis*. 222. *Myrica gale*. 223. *Alnus crispa* ssp. *sinuata*. 224. *Alnus oregona*. 225. *Humulus lupulus*. 226. *Urtica dioica*.



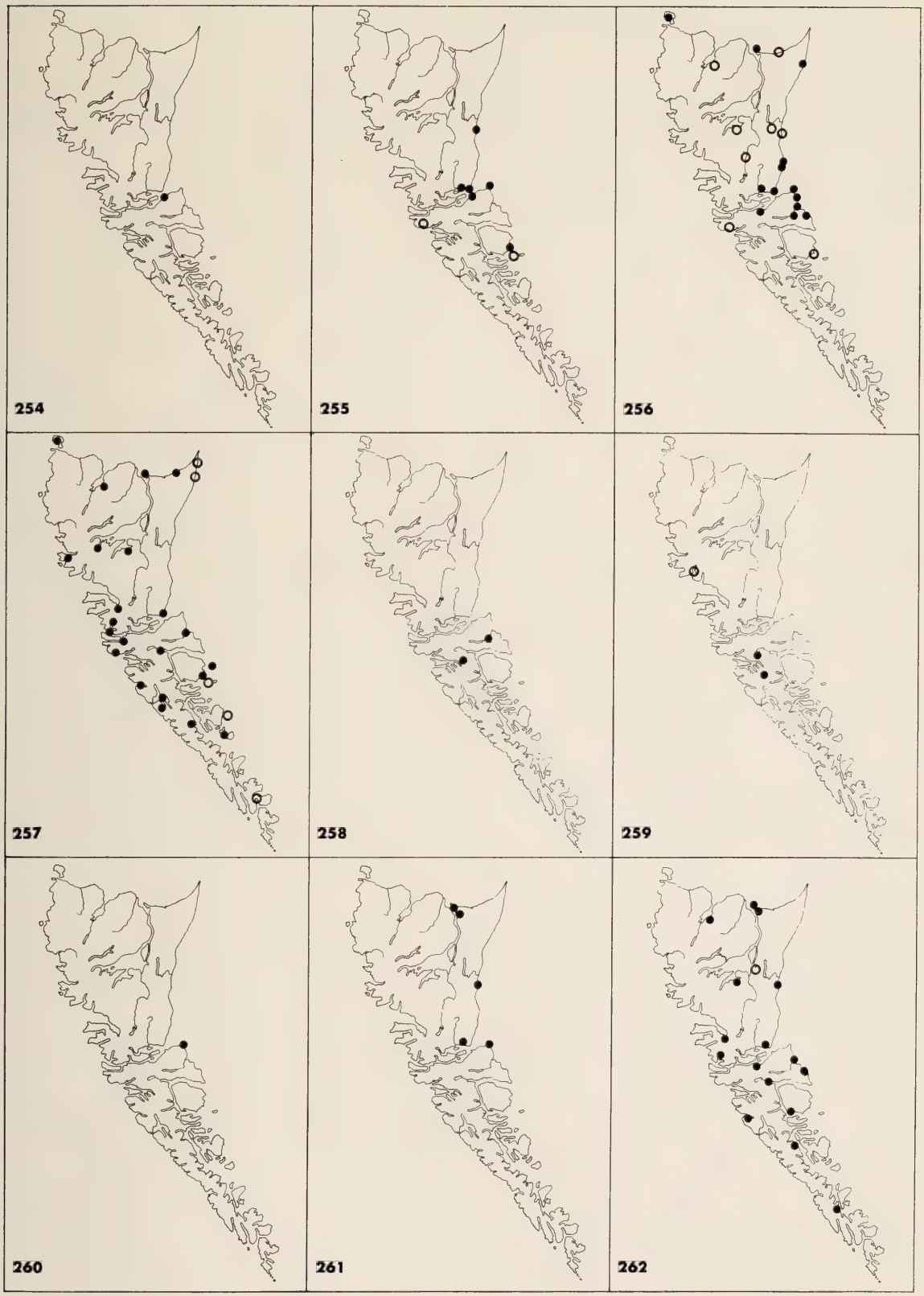
MAPS 227-235. 227. *Arceuthobium campylopodum*. 228. *Oxyria digyna*. 229. *Polygonum aviculare*. 230. *Polygonum convolvulus*. 231. *Polygonum fowleri*. 232. *Polygonum persicaria*. 233. *Polygonum polystachyum*. 234. *Polygonum scabrum*. 235. *Polygonum viviparum*.



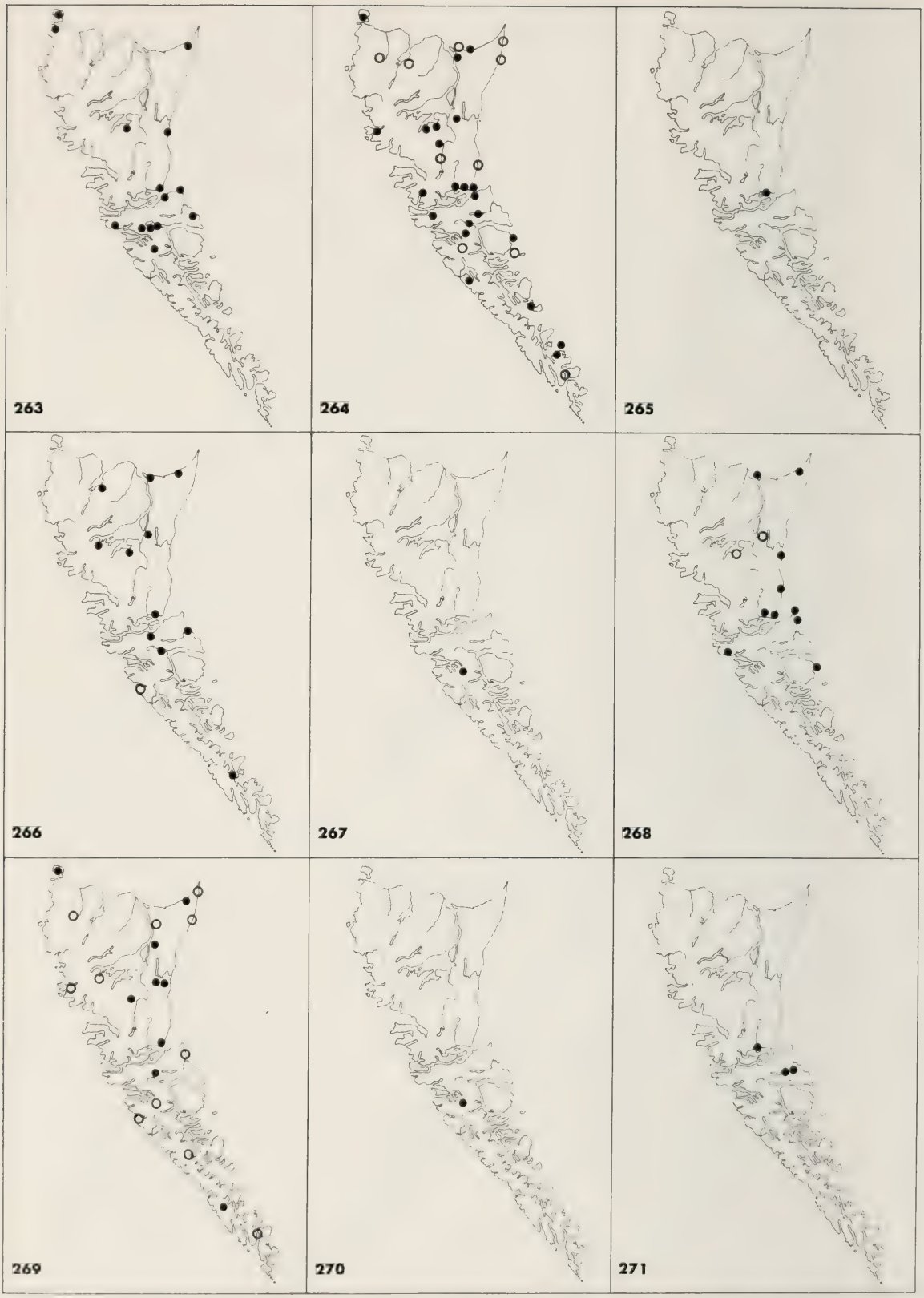
Maps 236-244. 236. *Rumex acetosella*. 237. *Rumex crispus*. 238. *Rumex obtusifolius*. 239. *Rumex occidentalis*. 240. *Rumex transitorius*. 241. *Atriplex patula* ssp. *obtusa*. 242. *Chenopodium album*. 243. *Salicornia pacifica*. 244. *Suaeda depressa*.



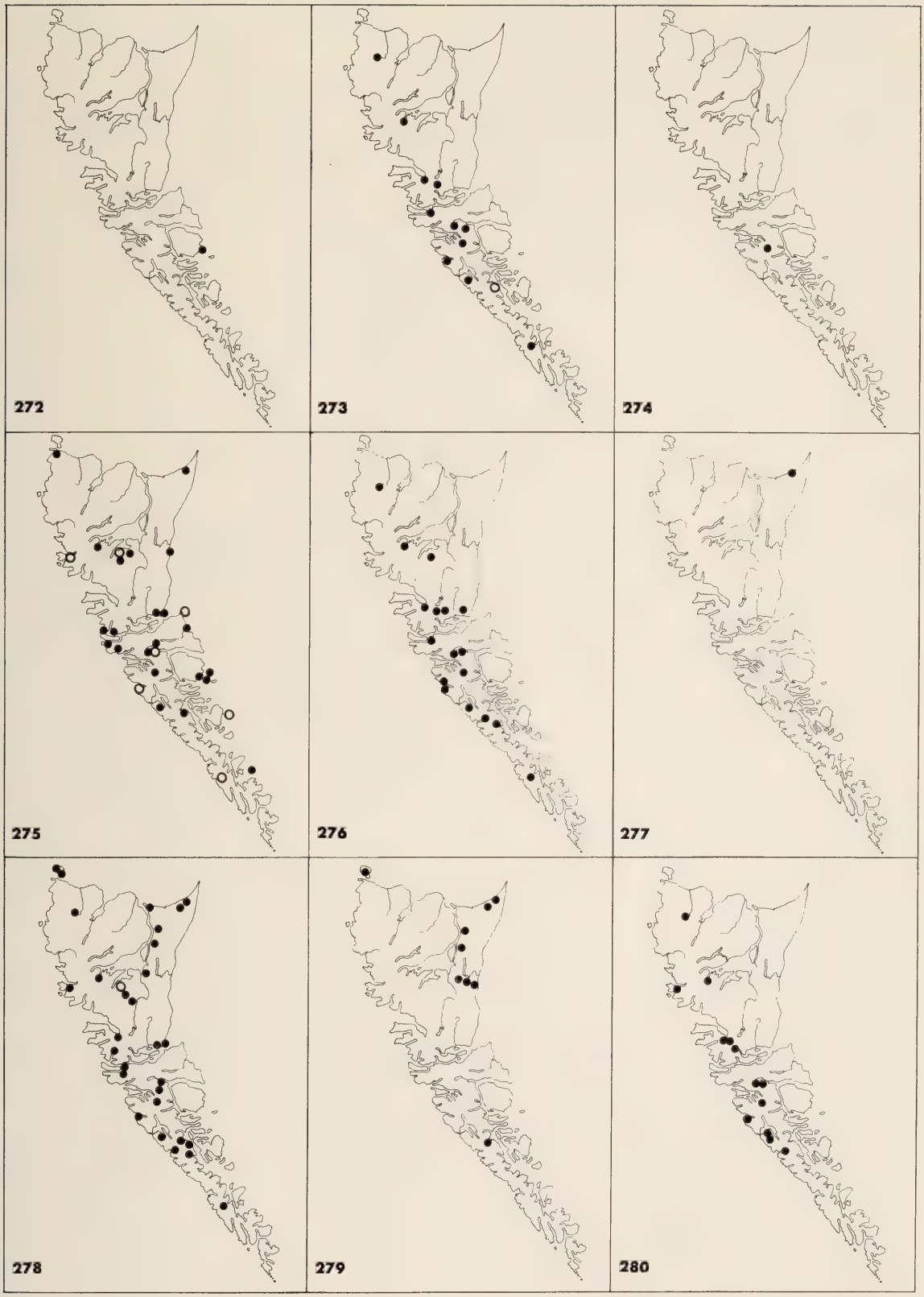
MAPS 245-253. 245. *Abronia latifolia*. 246. *Montia fontana*. 247. *Montia parvifolia*. 248. *Montia sibirica*. 249. *Arenaria lateriflora*. 250. *Arenaria peploides* ssp. *major*. 251. *Arenaria stricta* ssp. *macra*. 252. *Cerastium arvense*. 253. *Cerastium fischerianum*.



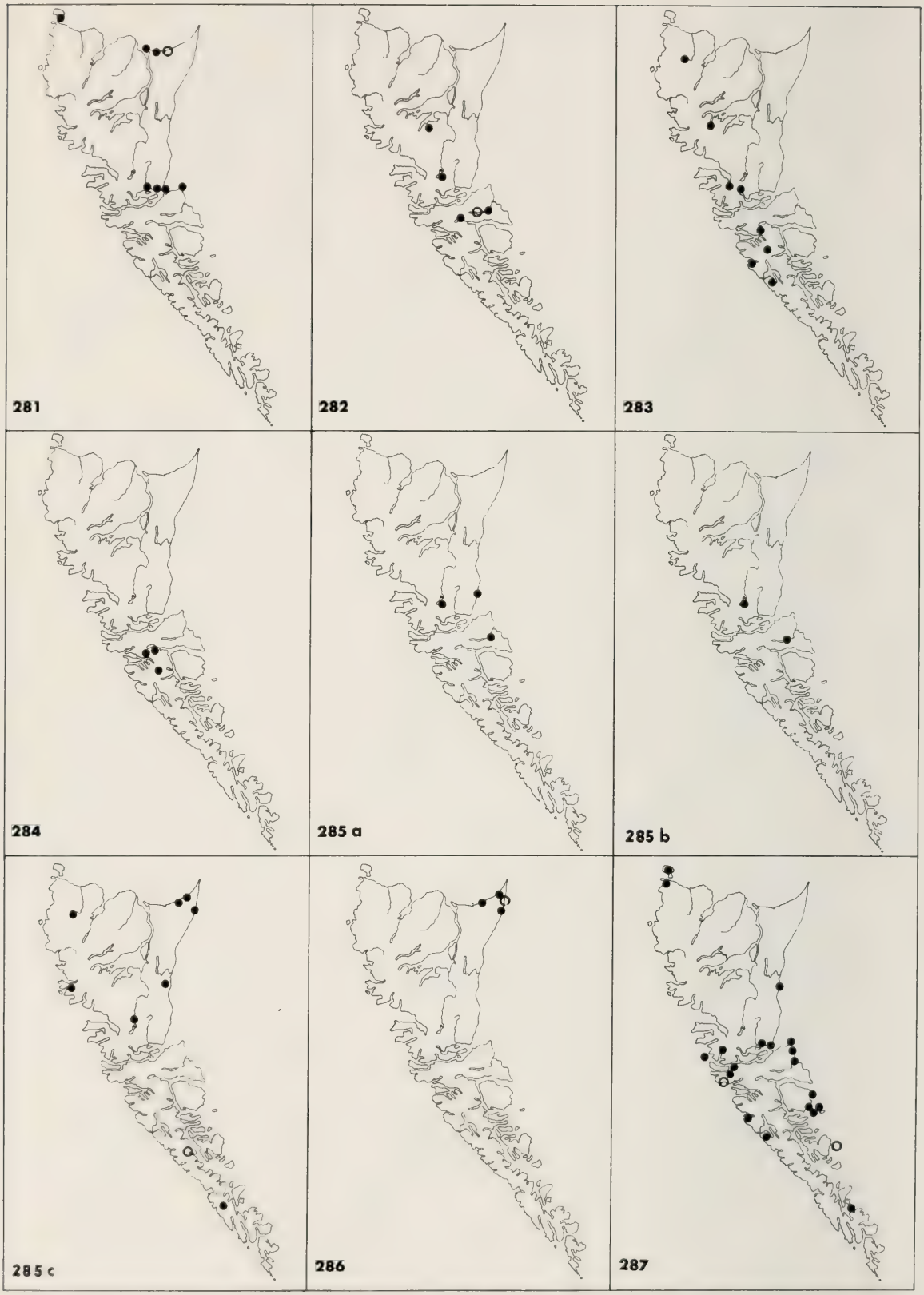
Maps 254-262. 254. *Cerastium tomentosum*. 255. *Cerastium viscosum*. 256. *Cerastium vulgatum*. 257. *Sagina maxima*. 258. *Sagina procumbens*. 259. *Silene acaulis* ssp. *subacaulescens*. 260. *Silene noctiflora*. 261. *Spergula arvensis*. 262. *Spergularia canadensis*.



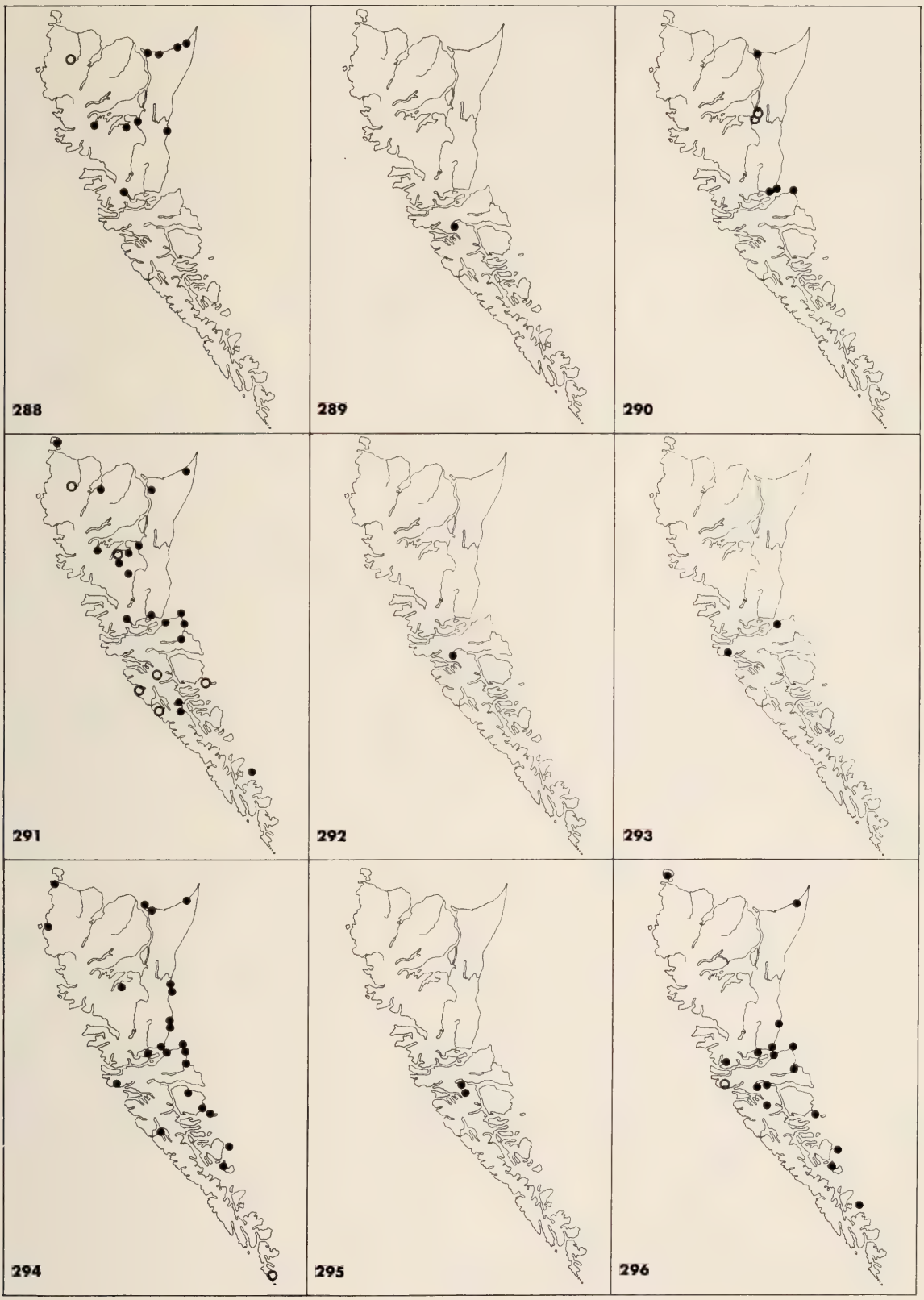
MAPS 263-271. 263. *Stellaria calycantha*. 264. *Stellaria crispa*. 265. *Stellaria graminea*. 266. *Stellaria humifusa*. 267. *Stellaria longipes*. 268. *Stellaria media*. 269. *Nuphar luteum* ssp. *polysepalum*. 270. *Aconitum delphinifolium*. 271. *Actaea rubra* ssp. *arguta*.



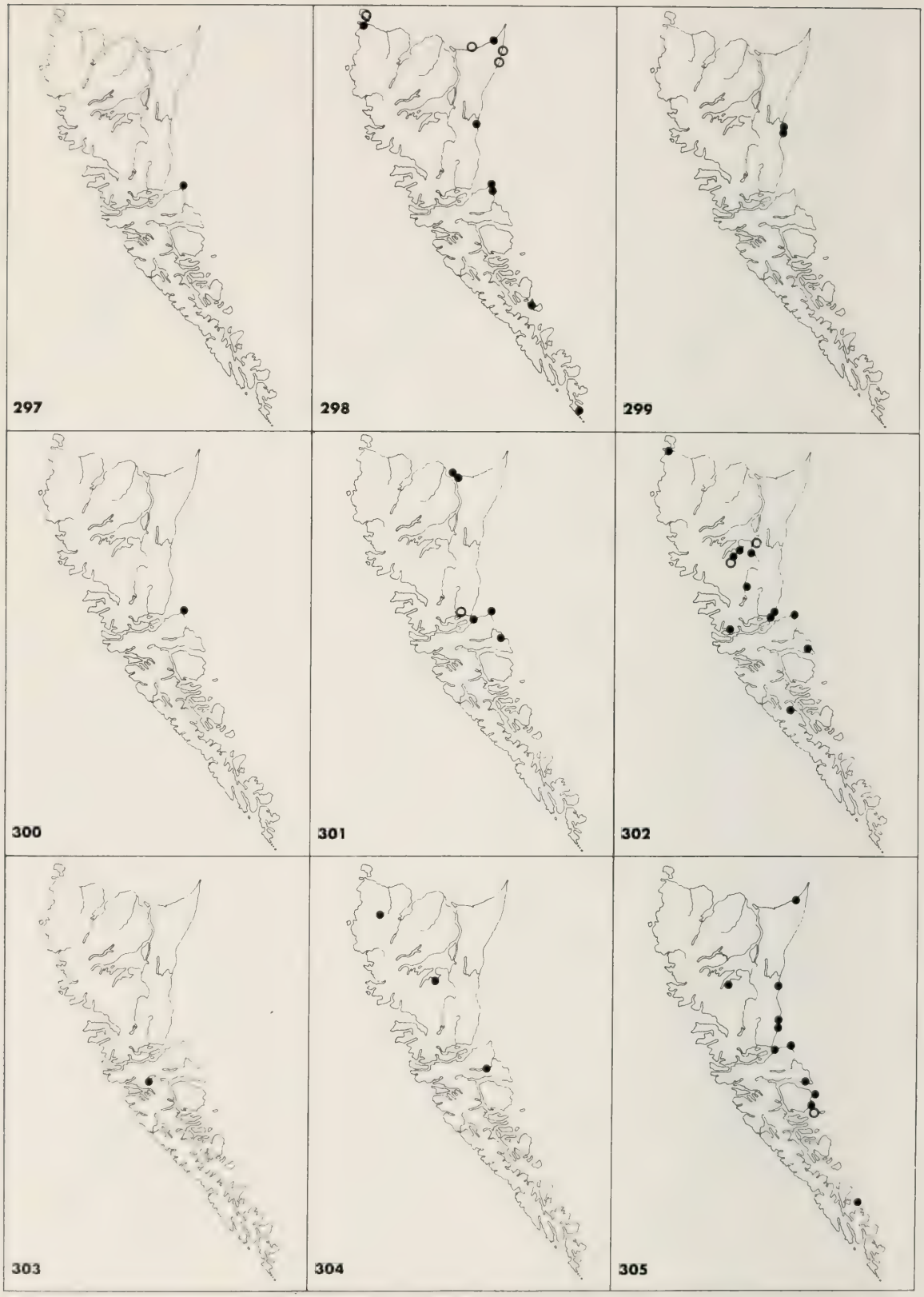
Maps 272-280. 272. *Anemone multifida*. 273. *Anemone narcissiflora* ssp. *alaskana*. 274. *Anemone parviflora*. 275. *Aquilegia formosa*. 276. *Caltha biflora*. 277. *Caltha palustris* ssp. *asarifolia*. 278. *Coptis asplenifolia*. 279. *Coptis trifolia*. 280. *Isopyrum savilei*.



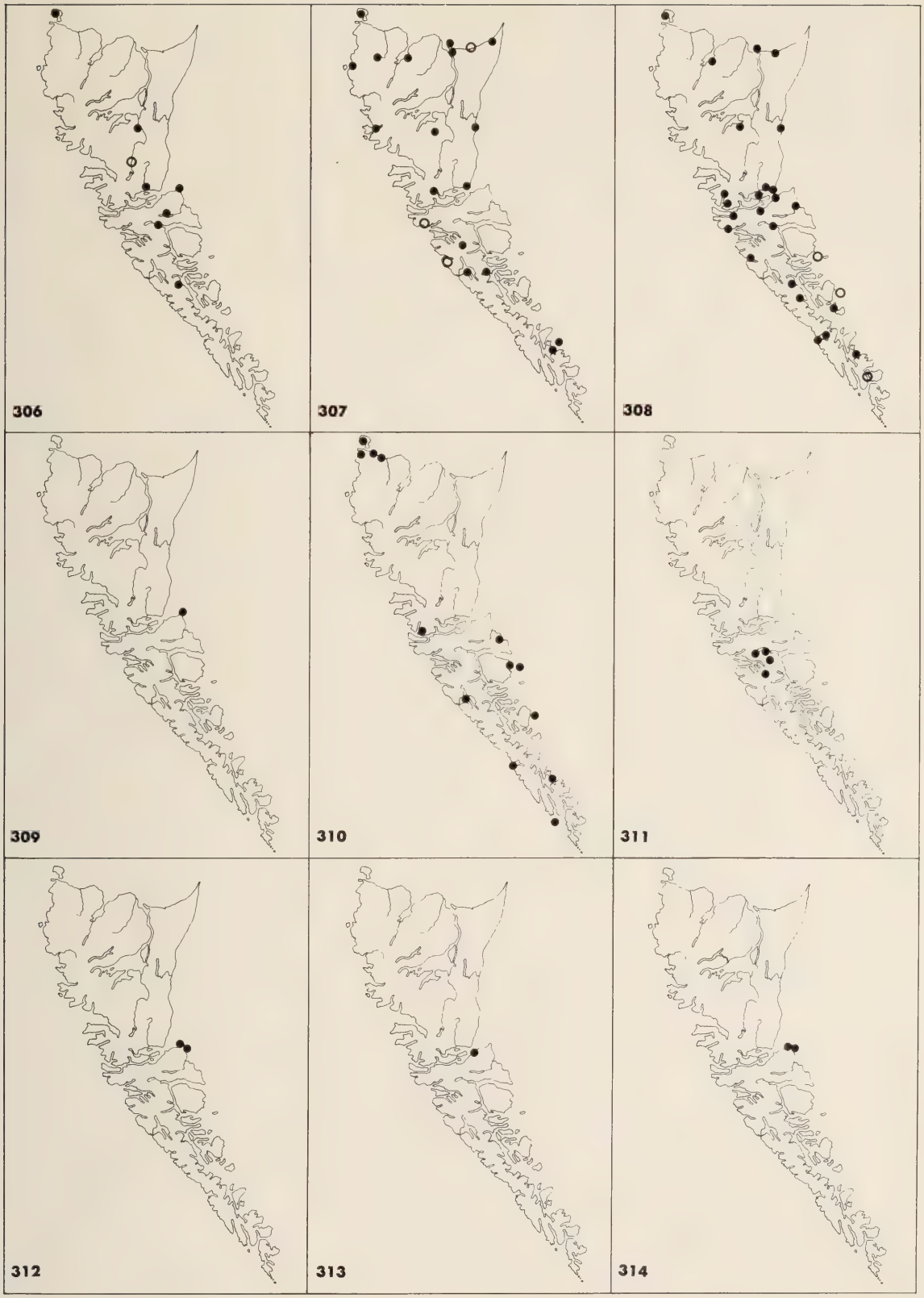
Maps 281-287. 281. *Ranunculus acris*. 282. *Ranunculus aquatilis*. 283. *Ranunculus cooleyae*. 284. *Ranunculus eschscholtzii*. 285a. *Ranunculus flammula* var. *flammula*. 285b. *Ranunculus flammula* var. *filiformis*. 285c. *Ranunculus flammula* var. *ovalis*. 286. *Ranunculus hyperboreus*. 287. *Ranunculus occidentalis*.



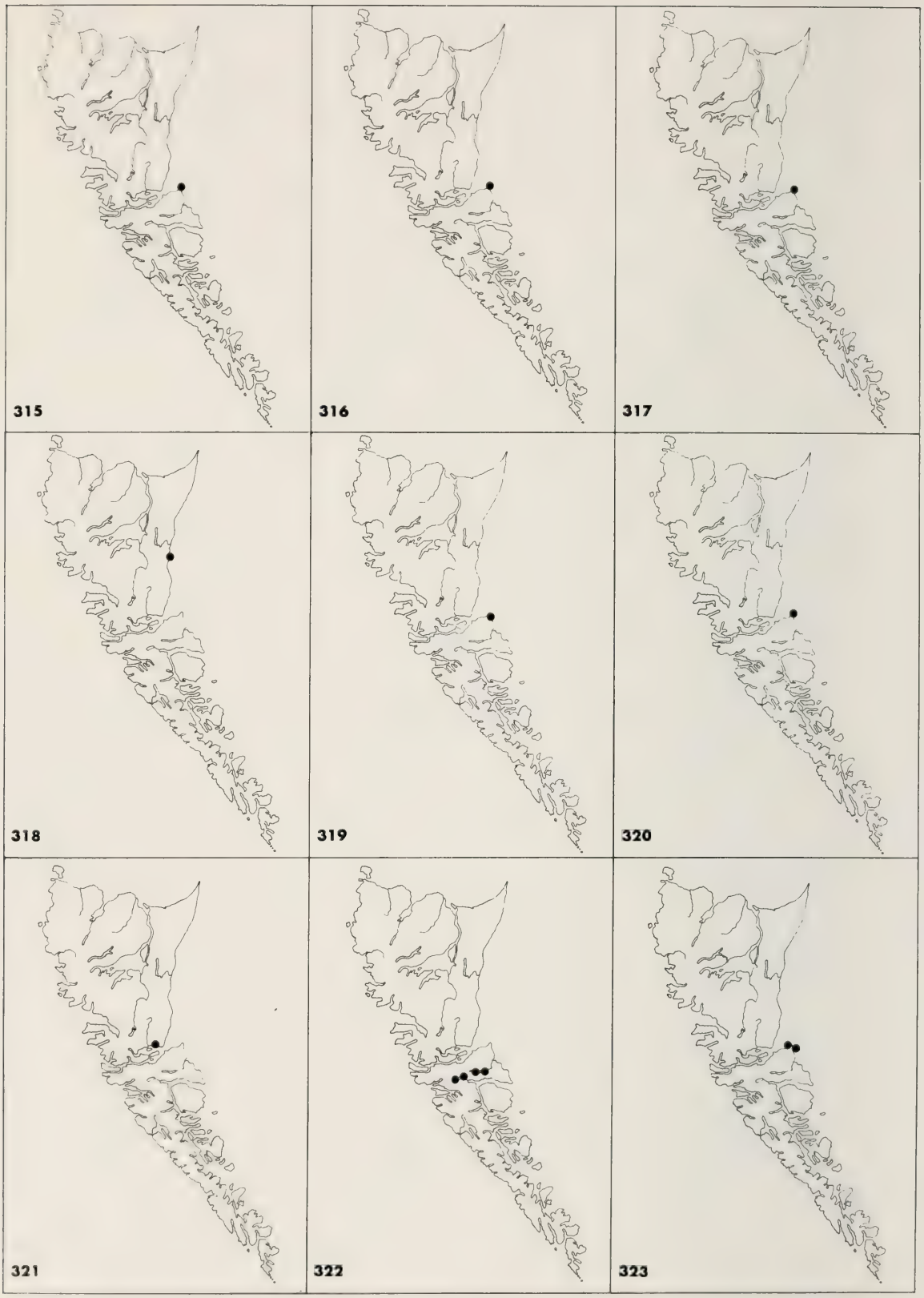
Maps: 288-296. 288. *Ranunculus orthorhynchus.* 289. *Ranunculus pygmaeus.* 290. *Ranunculus repens.* 291. *Ranunculus uncinatus.* 292. *Thalictrum alpinum.* 293. *Arabis glabra.* 294. *Arabis hirsuta* ssp. *eschscholtziana.* 295. *Arabis lyrata* ssp. *kamchatica.* 296. *Barbarea orthoceras.*



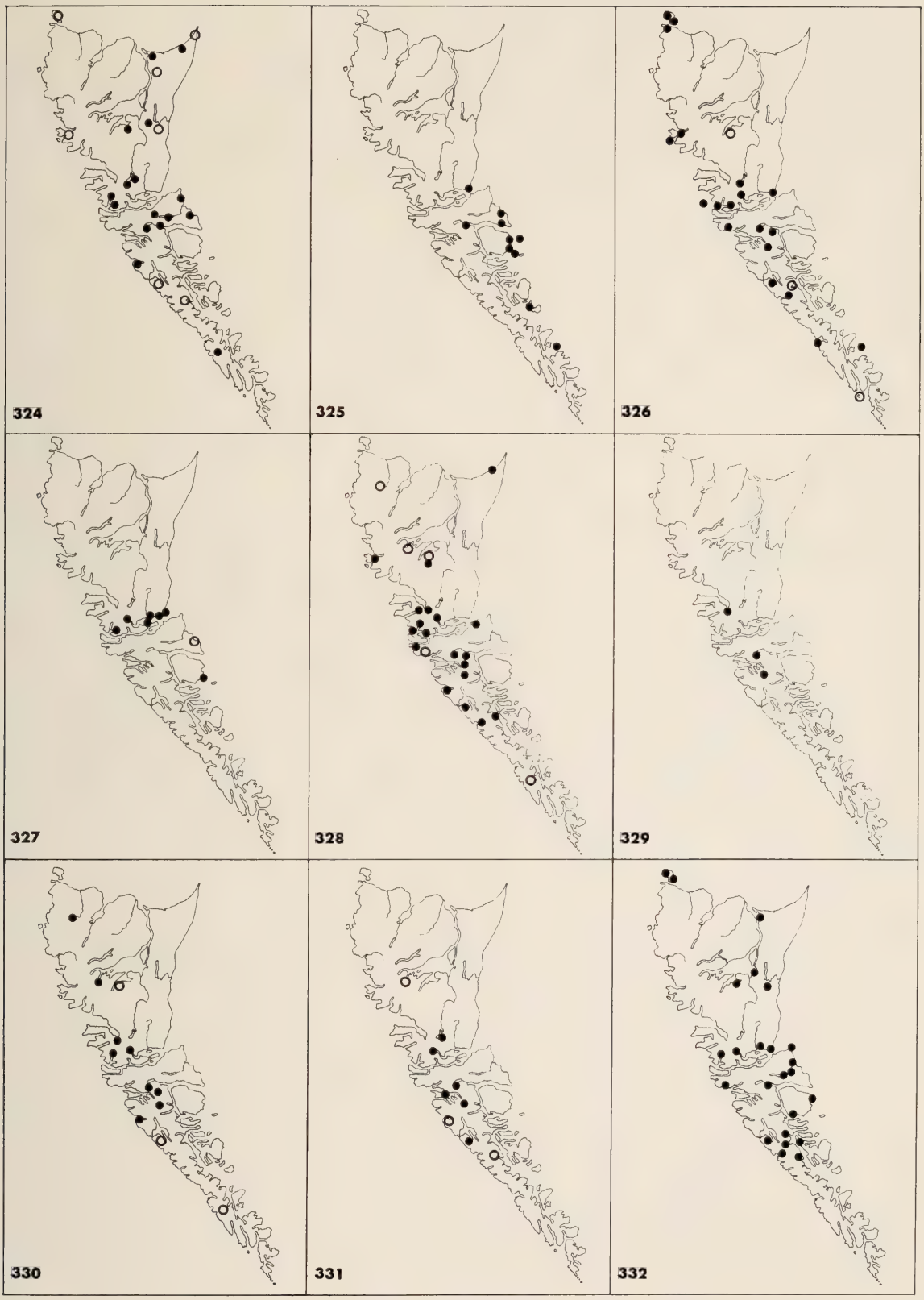
MAPS 297-305. 297. *Brassica campestris*. 298. *Cakile edentula*. 299. *Cakile maritima*. 300. *Camelina sativa*. 301. *Capsella bursa-pastoris*. 302. *Cardamine angulata*. 303. *Cardamine bellidifolia*. 304. *Cardamine occidentalis*. 305. *Cardamine oligosperma*.



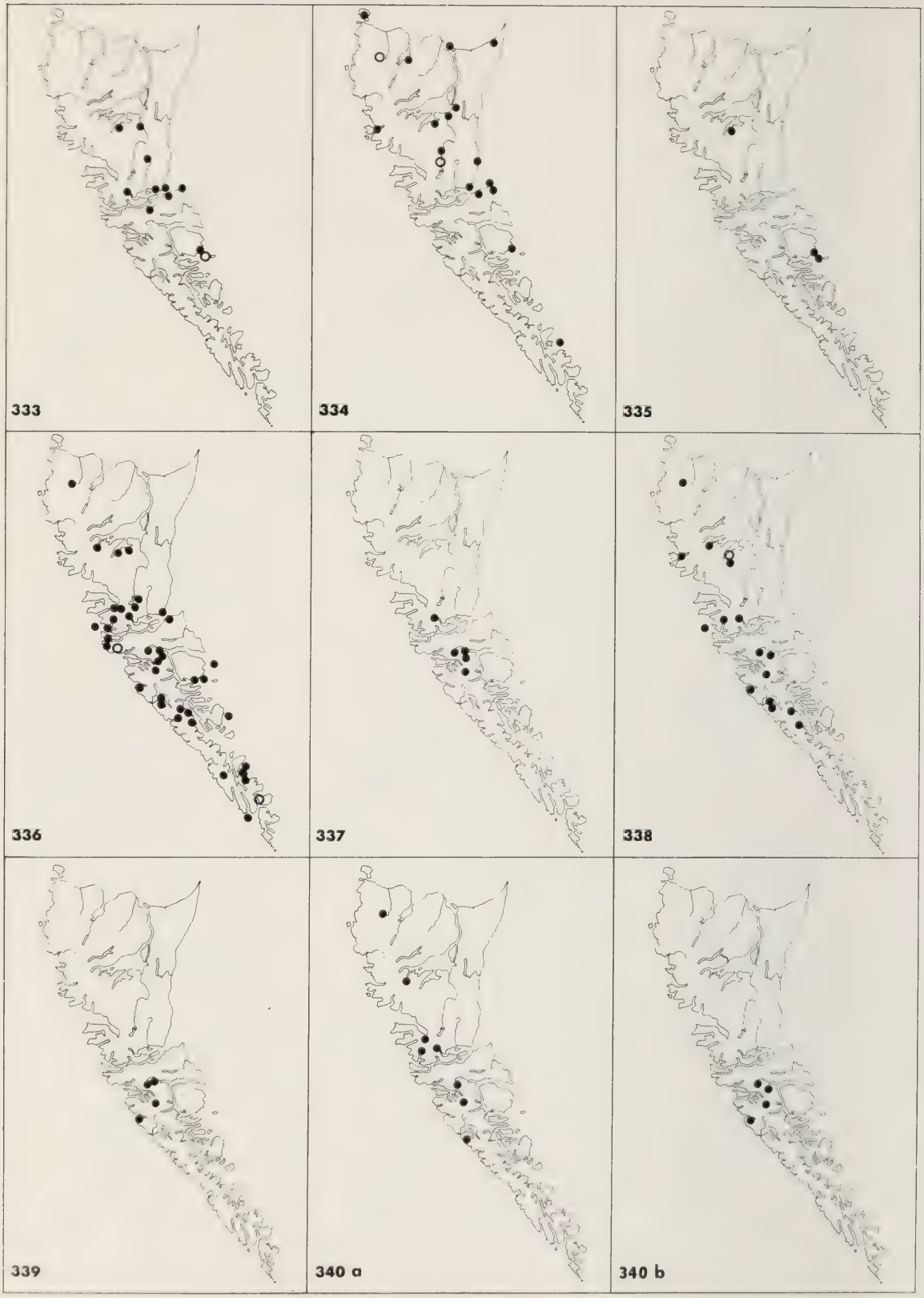
Maps 306-314. 306. *Cardamine pensylvanica*. 307. *Cardamine umbellata*. 308. *Cochlearia officinalis* ssp. *oblongifolia*. 309. *Descurainia sophia*. 310. *Draba hyperborea*. 311. *Draba lonchocarpa* ssp. *kamtschatica*. 312. *Erysimum cheiranthoides*. 313. *Hesperis matronalis*. 314. *Lepidium campestre*.



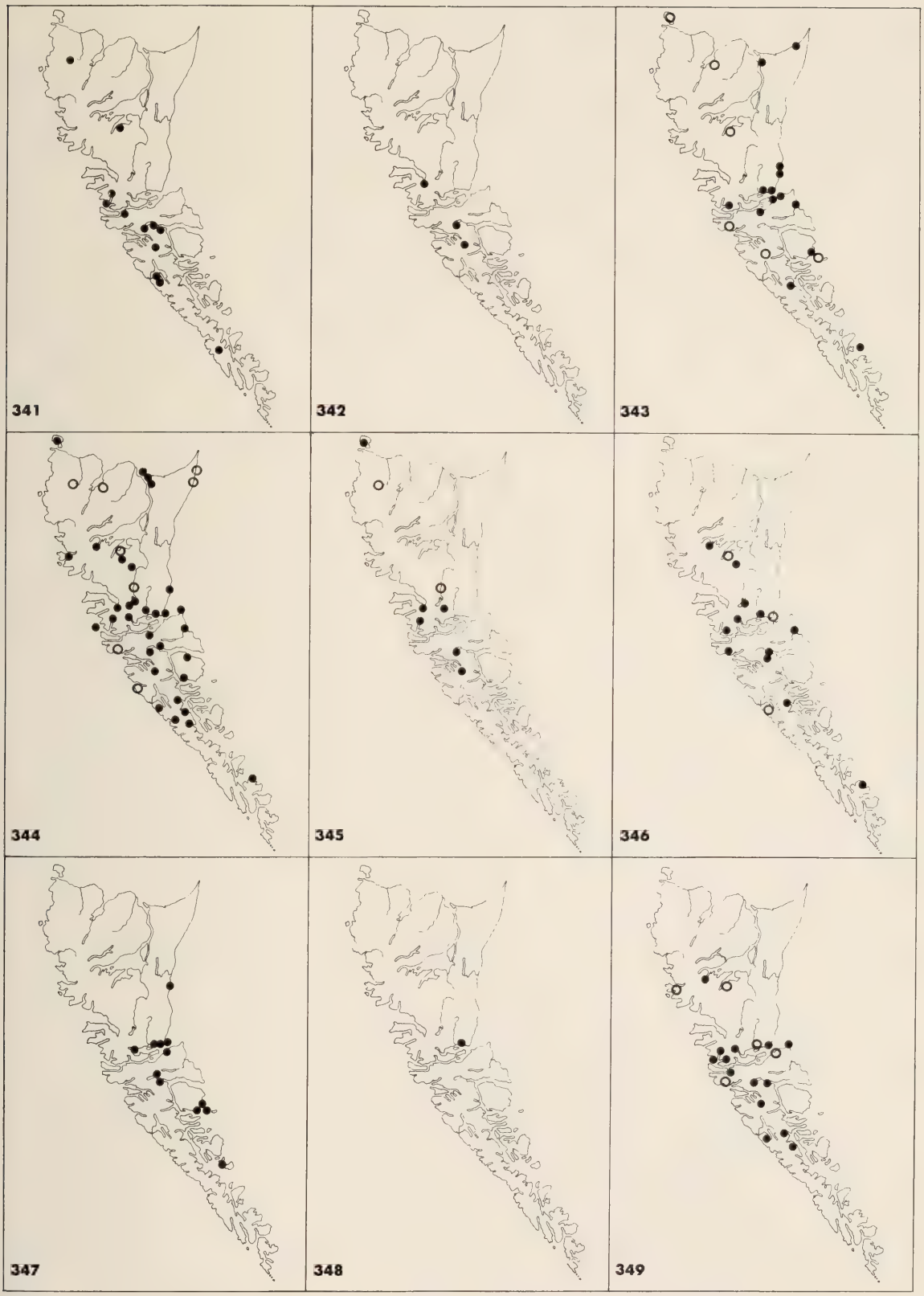
MAPS 315-323. 315. *Lepidium densiflorum*. 316. *Neslia paniculata*. 317. *Raphanus raphanistrum*. 318. *Rorippa islandica*. 319. *Sinapis arvensis*. 320. *Sisymbrium altissimum*. 321. *Sisymbrium officinale*. 322. *Subularia aquatica* ssp. *americana*. 323. *Thlaspi arvense*.



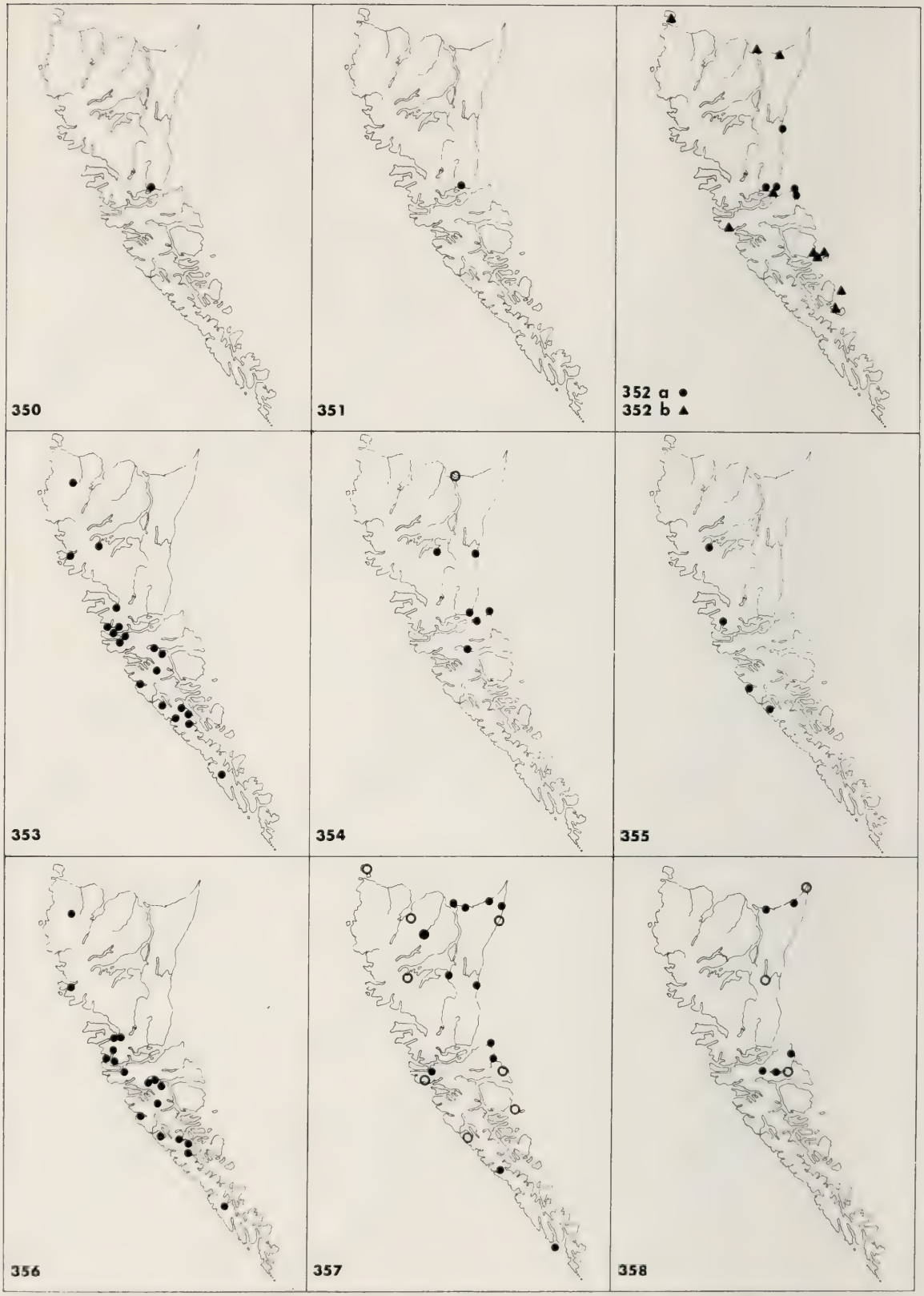
Maps 324-332. 324. *Drosera rotundifolia.* 325. *Sedum divergens.* 326. *Sedum roseum.* 327. *Heuchera chlorantha.* 328. *Heuchera glabra.* 329. *Leptarrhena pyrolifolia.* 330. *Mitella pentandra.* 331. *Parnassia fimbriata.* 332. *Ribes bracteosum.*



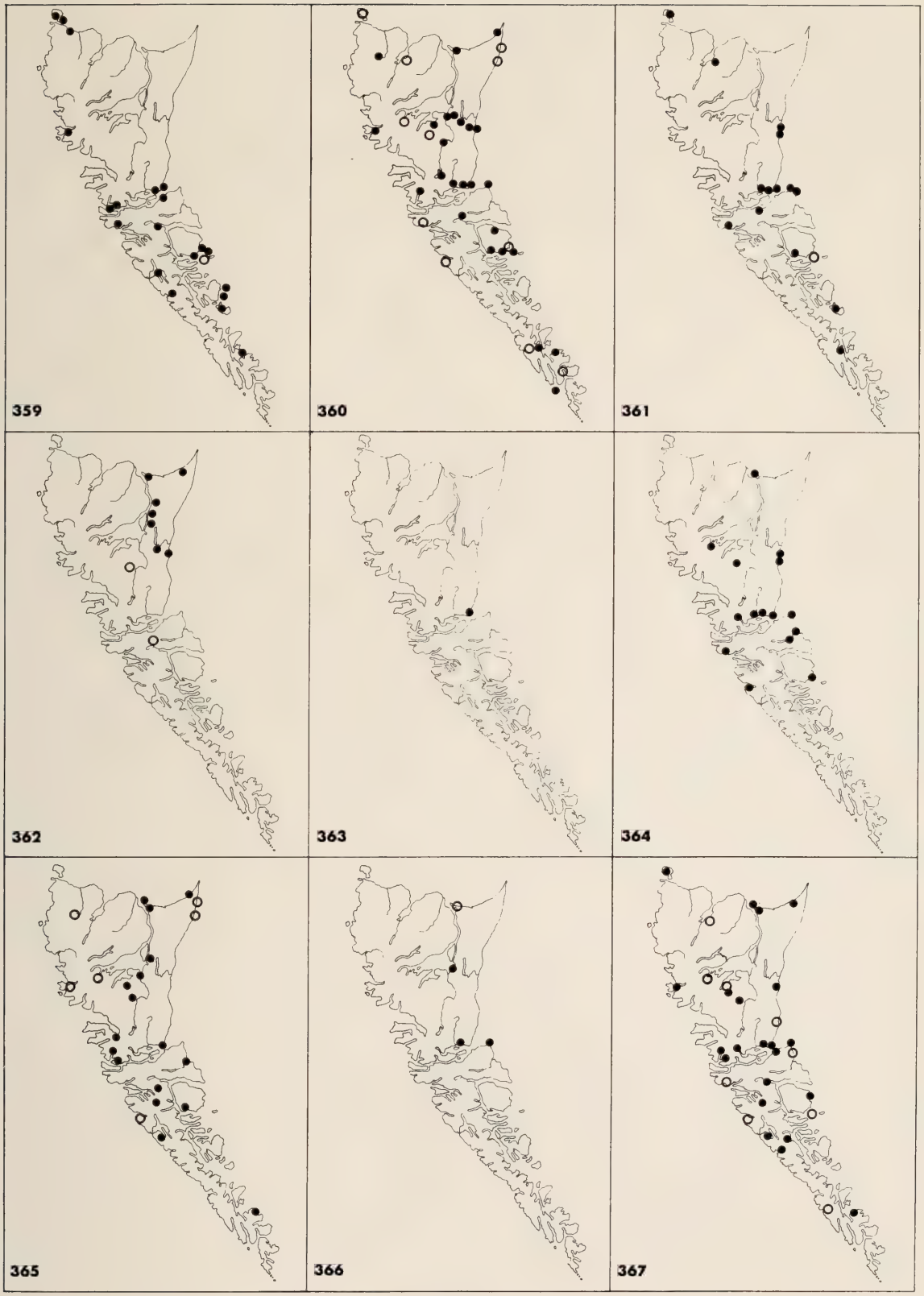
MAPS 333-340b. 333. *Ribes lacustre*. 334. *Ribes laxiflorum*. 335. *Saxifraga caespitosa*. 336. *Saxifraga ferruginea*. 337. *Saxifraga lyallii* ssp. *hultenii*. 338. *Saxifraga mertensiana*. 339. *Saxifraga oppositifolia*. 340a. *Saxifraga punctata* ssp. *carlottae*. 340b. *Saxifraga punctata* ssp. *cascadensis*.



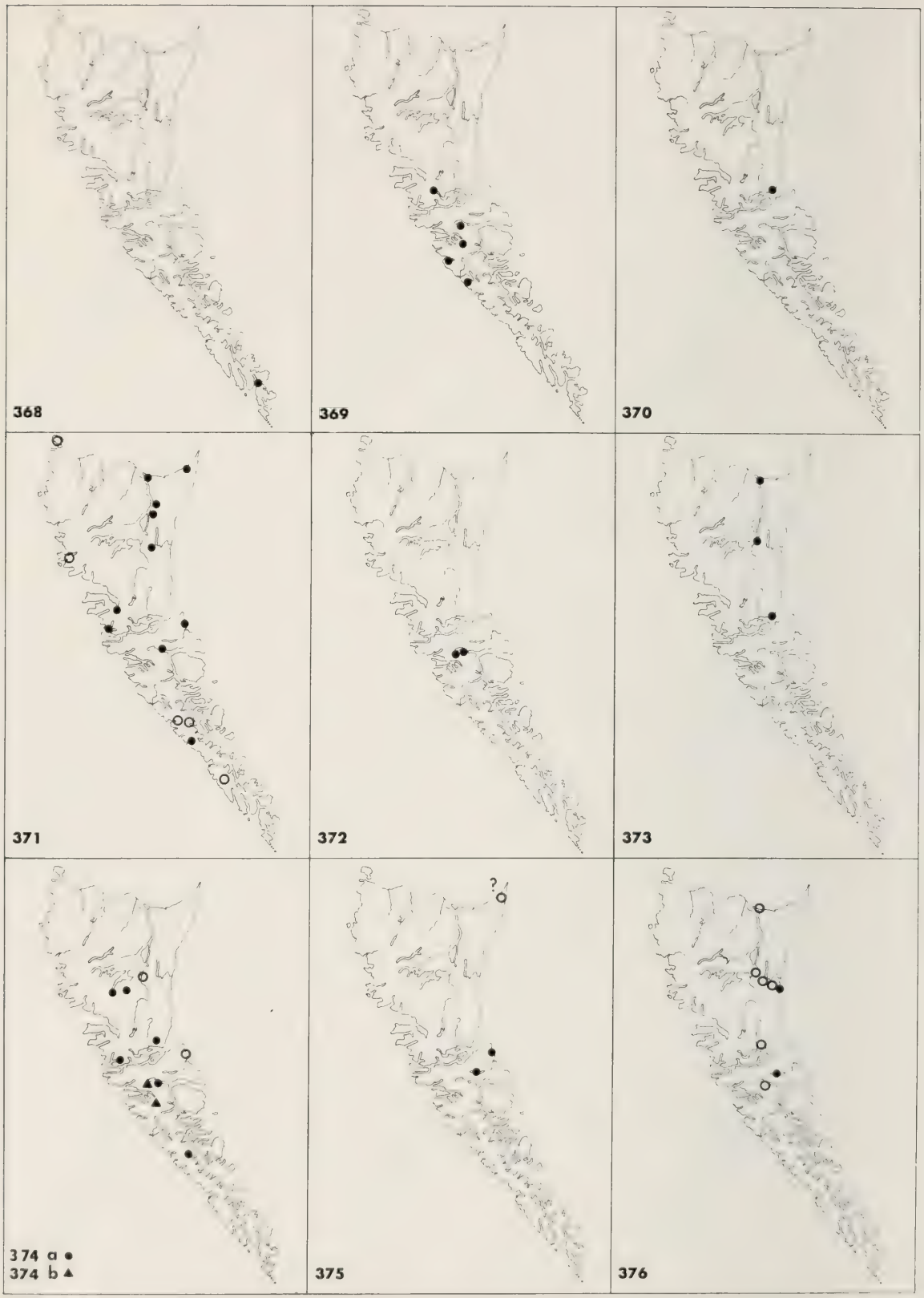
Maps 341-349. 341. *Saxifraga taylori*. 342. *Saxifraga tolmiei*. 343. *Tellima grandiflora*. 344. *Tiarella trifoliata*. 345. *Tiarella unifoliata*. 346. *Tolmiea menziesii*. 347. *Amelanchier florida*. 348. *Aphanes occidentalis*. 349. *Aruncus sylvester*.



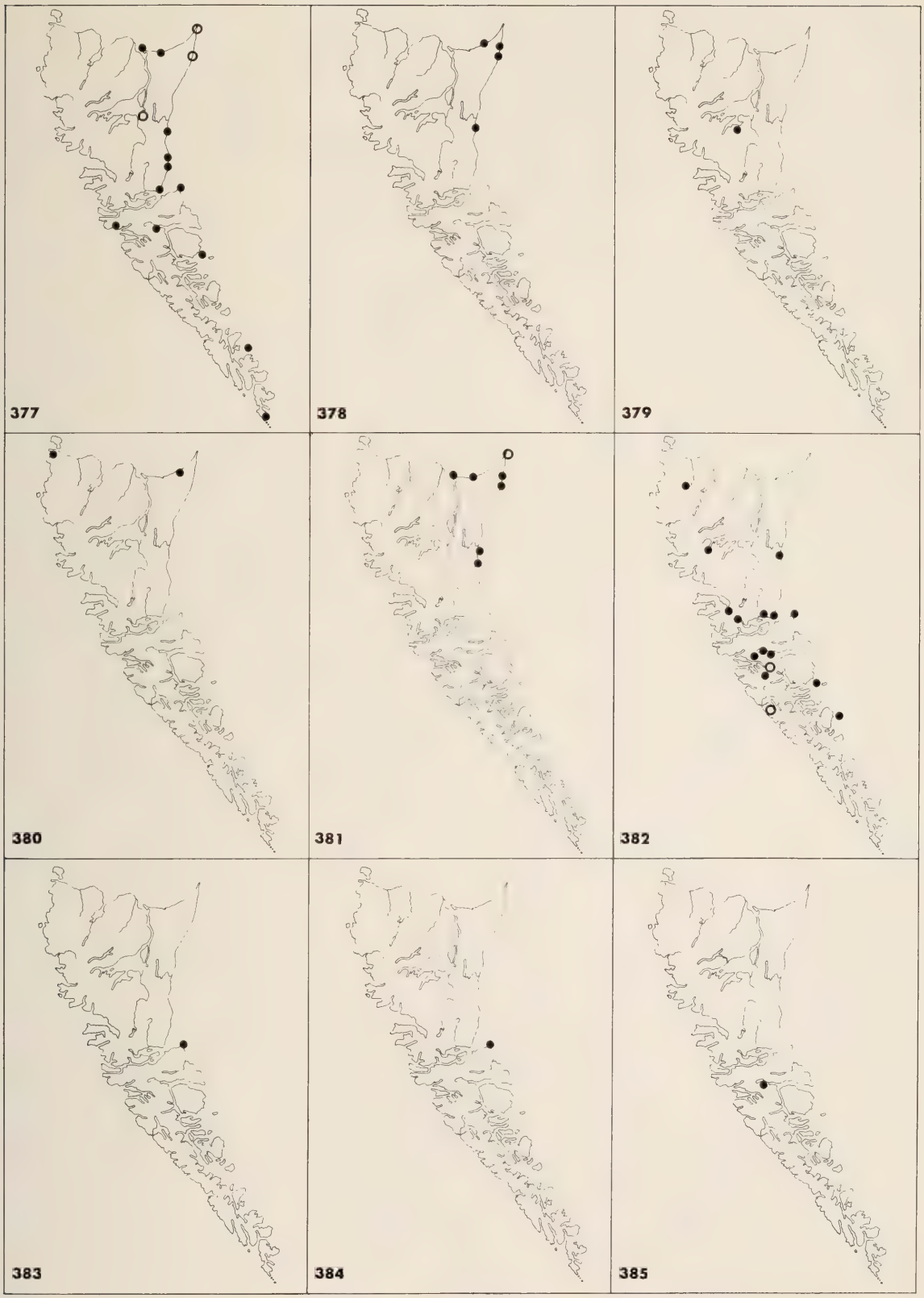
MAPS 350-358. 350. *Crataegus douglasii.* 351. *Crataegus monogyna.* 352a. *Fragaria chiloensis* ssp. *lucida;* 352b. *Fragaria chiloensis* ssp. *pacifica.* 353. *Geum calthifolium.* 354. *Geum macrophyllum.* 355. *Geum schofieldii.* 356. *Luetkea pectinata.* 357. *Potentilla pacifica.* 358. *Potentilla palustris.*



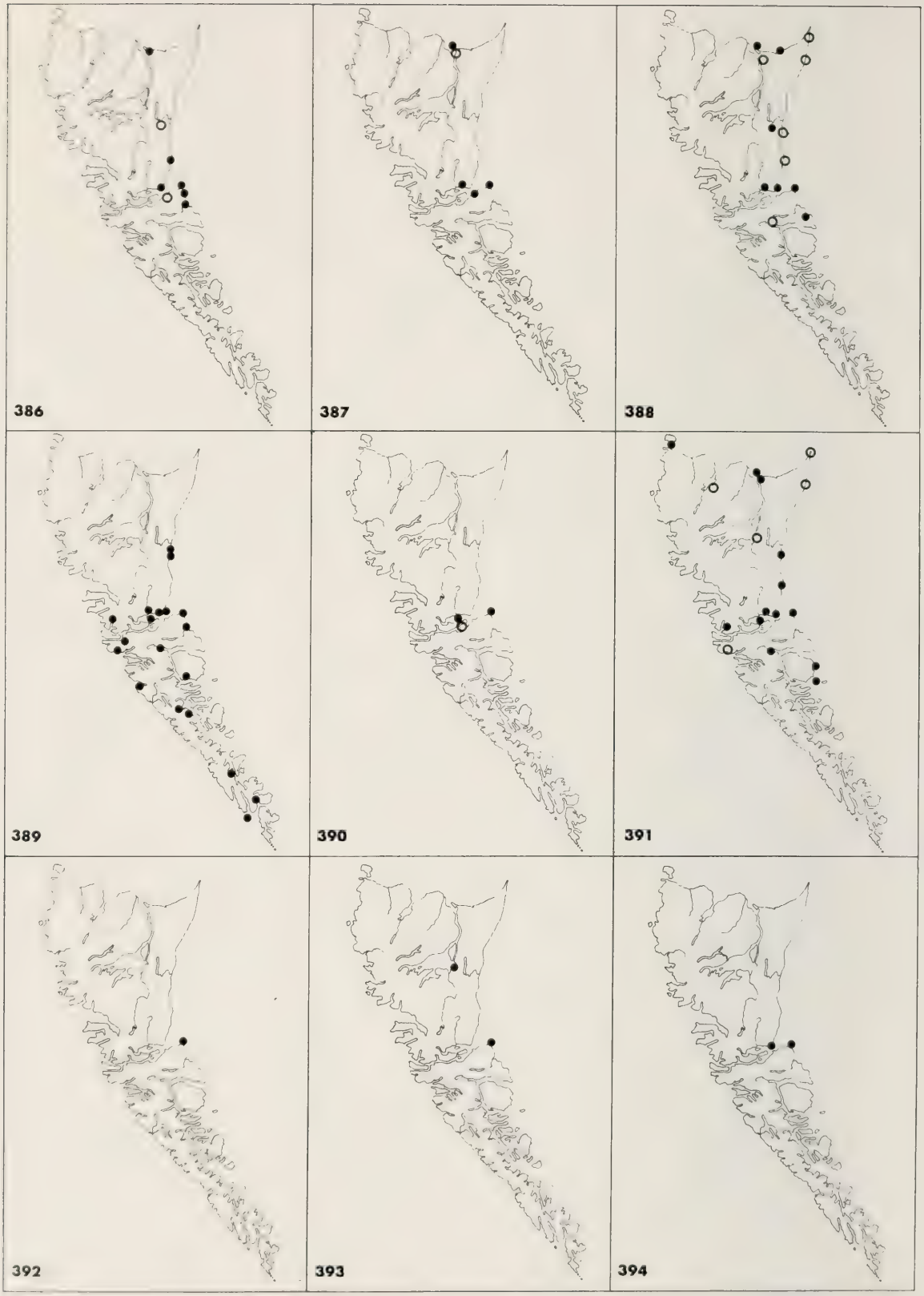
MAPS 359-367. 359. *Potentilla villosa*. 360. *Pyrus fusca*. 361. *Rosa nutkana*. 362. *Rubus chamaemorus*. 363. *Rubus laciniatus*. 364. *Rubus parviflorus*. 365. *Rubus pedatus*. 366. *Rubus procerus*. 367. *Rubus spectabilis*.



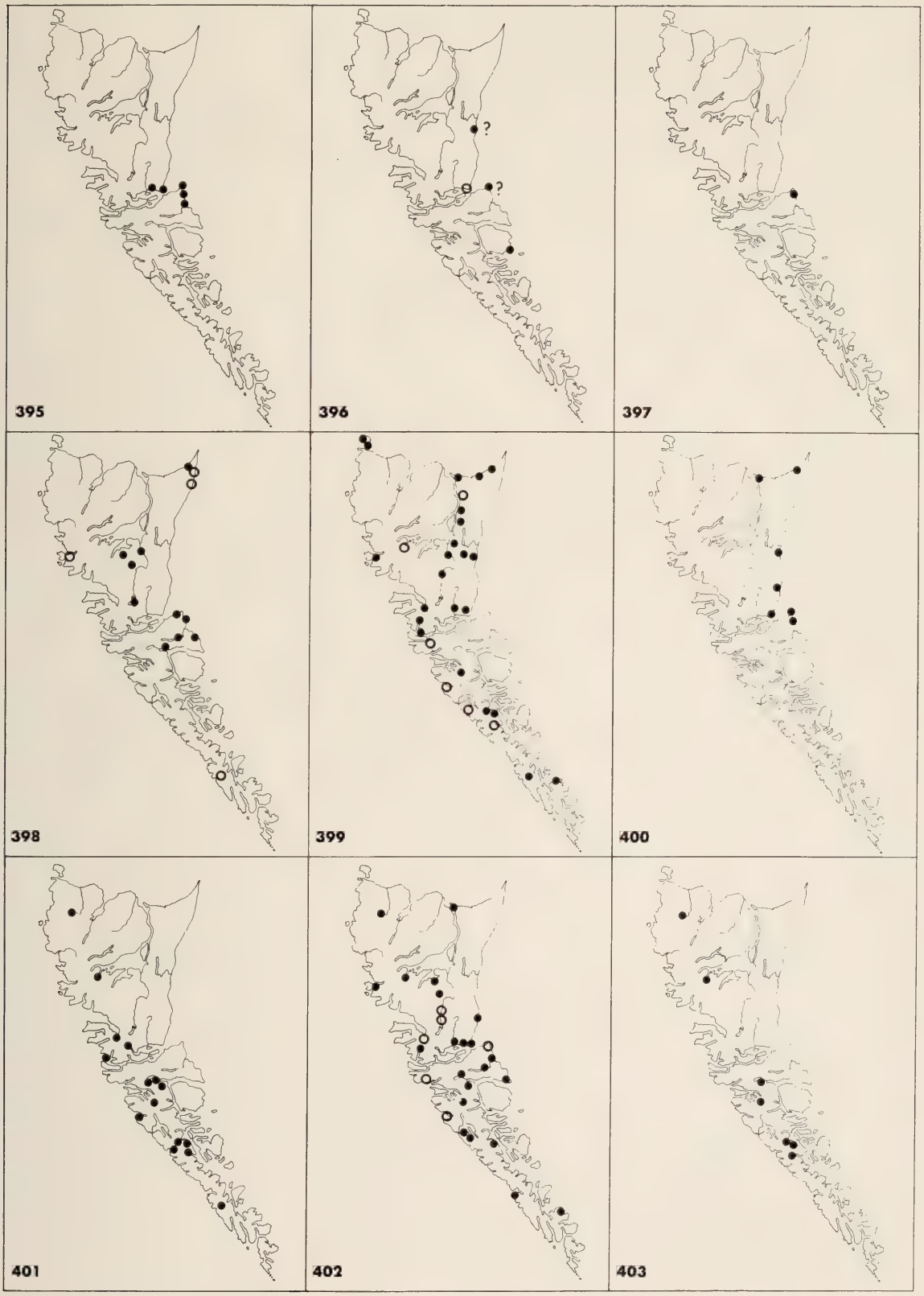
MAPS 368-376. 368. *Rubus ursinus*. 369. *Sanguisorba canadensis* ssp. *latifolia*. 370. *Sanguisorba menziesii*. 371. *Sanguisorba officinalis* ssp. *microcephala*. 372. *Sibbaldia procumbens*. 373. *Sorbus aucuparia*. 374a. *Sorbus sitchensis* ssp. *sitchensis*; 374b. *Sorbus sitchensis* ssp. *grayi*. 375. *Spiraea douglasii* ssp. *menziesii*. 376. *Cytisus scoparius*.



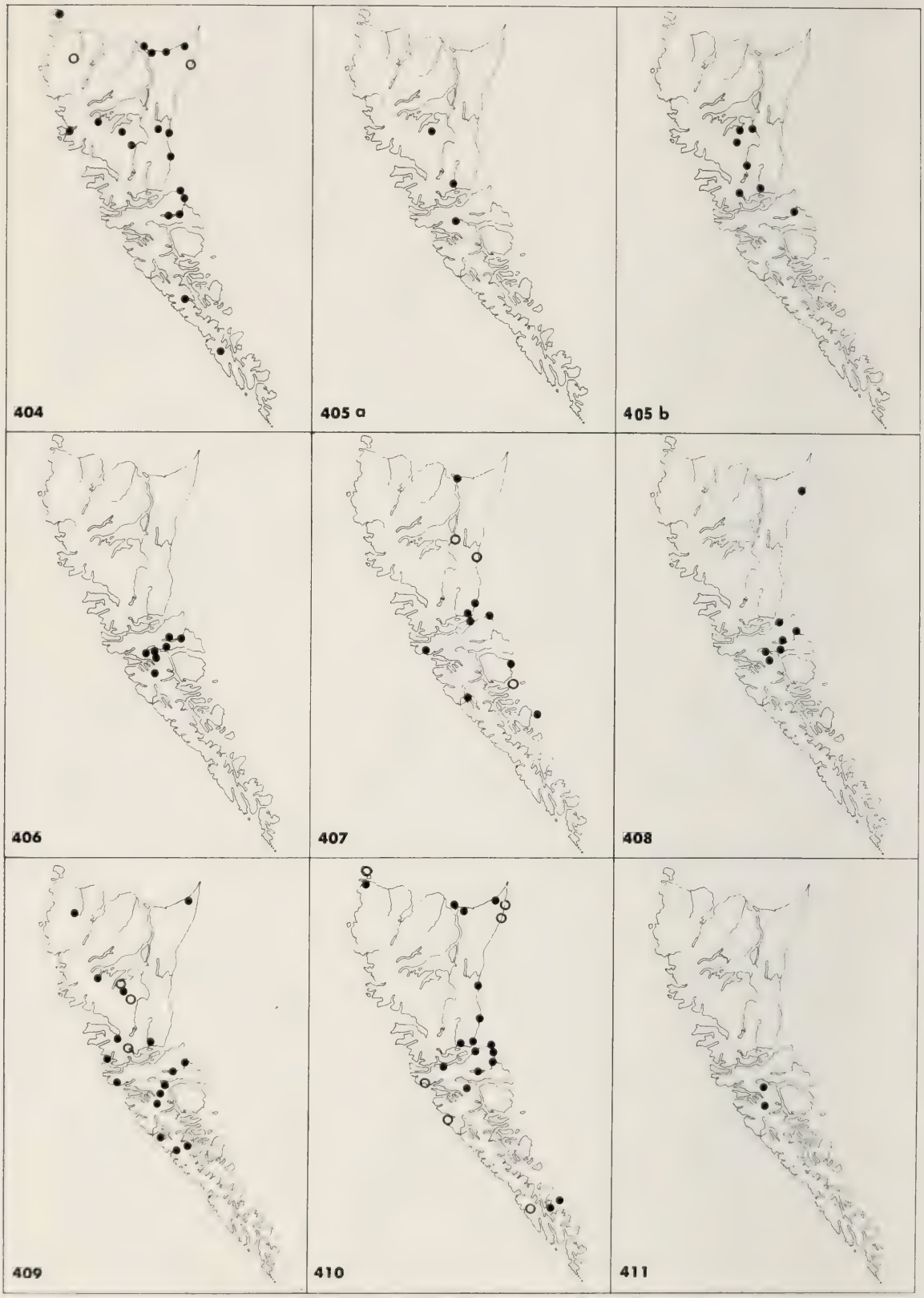
MAPS 377-385. 377. *Lathyrus japonicus.* 378. *Lathyrus littoralis.* 379. *Lathyrus ochroleucus.* 380. *Lathyrus palustris.* 381. *Lupinus littoralis.* 382. *Lupinus nootkatensis.* 383. *Melilotus alba.* 384. *Melilotus officinalis.* 385. *Oxytropis campestris.*



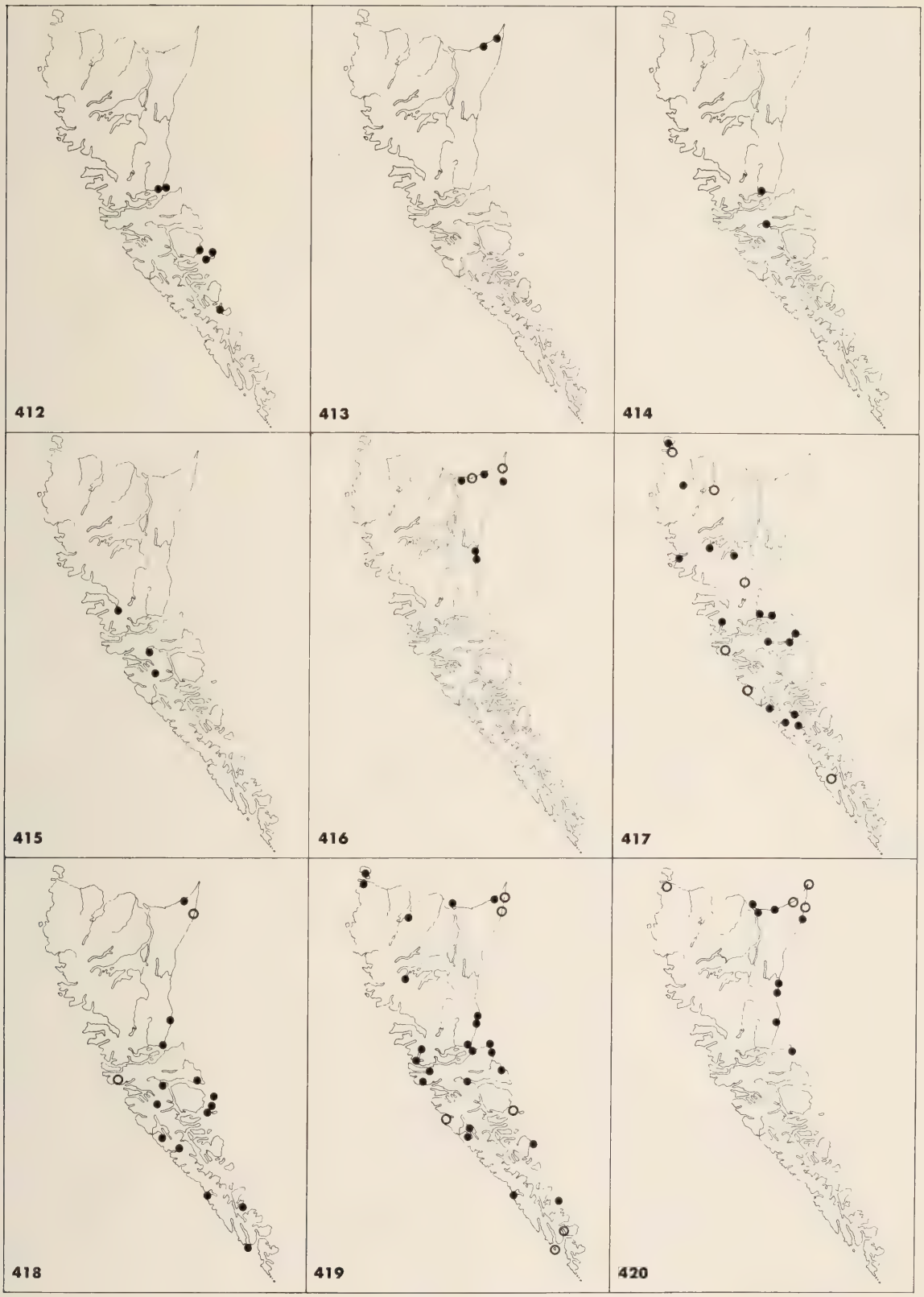
MAPS 386-394. 386. *Trifolium dubium*. 387. *Trifolium pratense*. 388. *Trifolium repens*. 389. *Trifolium wormskjoldii*. 390. *Ulex europaeus*. 391. *Vicia gigantea*. 392. *Vicia sativa*. 393. *Vicia villosa*. 394. *Geranium dissectum*.



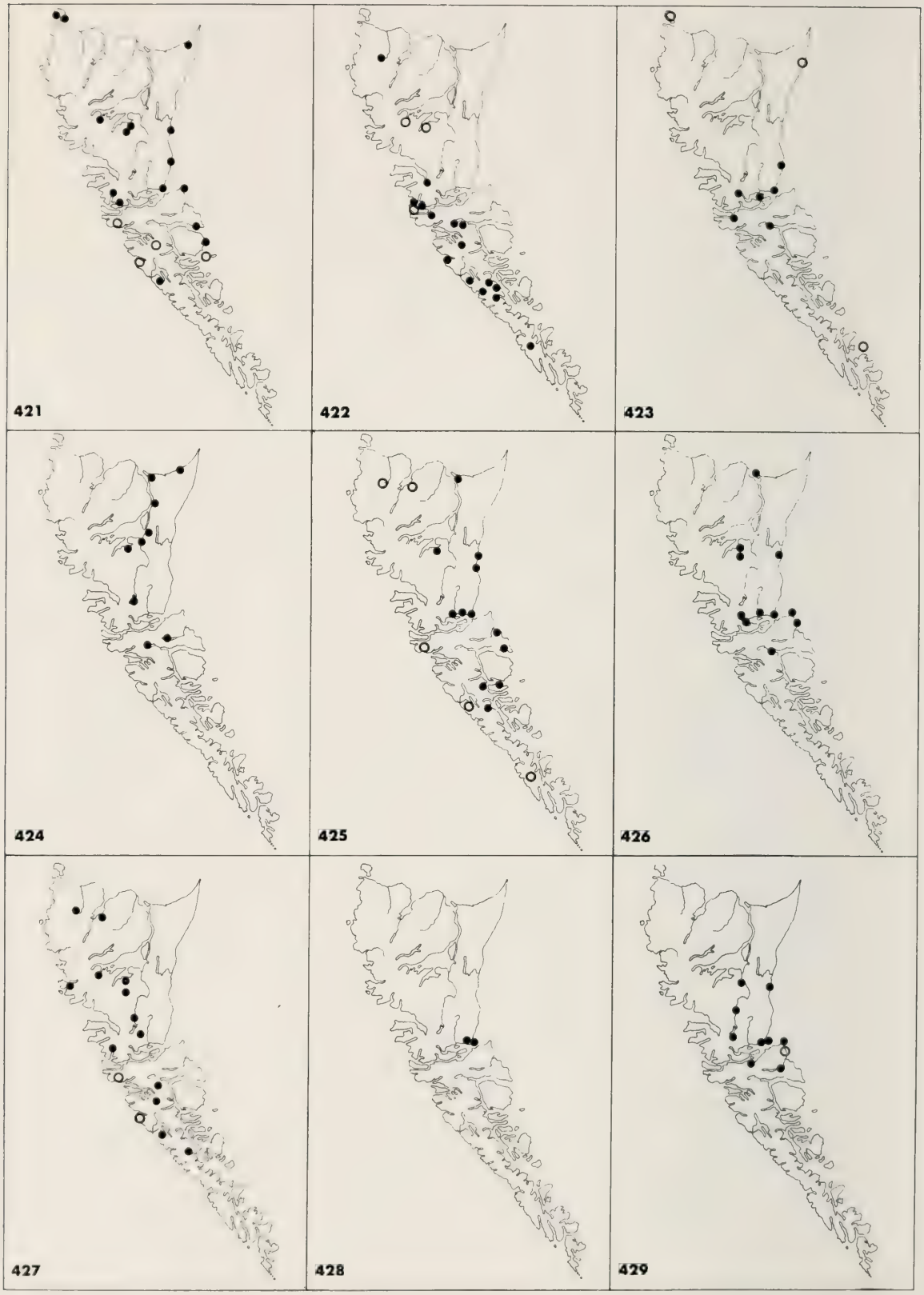
Maps 395-403. 395. *Geranium molle*. 396. *Geranium richardsonii*. 397. *Linum bienne*. 398. *Callitriche heterophylla* ssp. *bolanderi*. 399. *Empetrum nigrum*. 400. *Viola adunca*. 401. *Viola biflora* ssp. *carlottae*. 402. *Viola glabella*. 403. *Viola langsdorffii*.



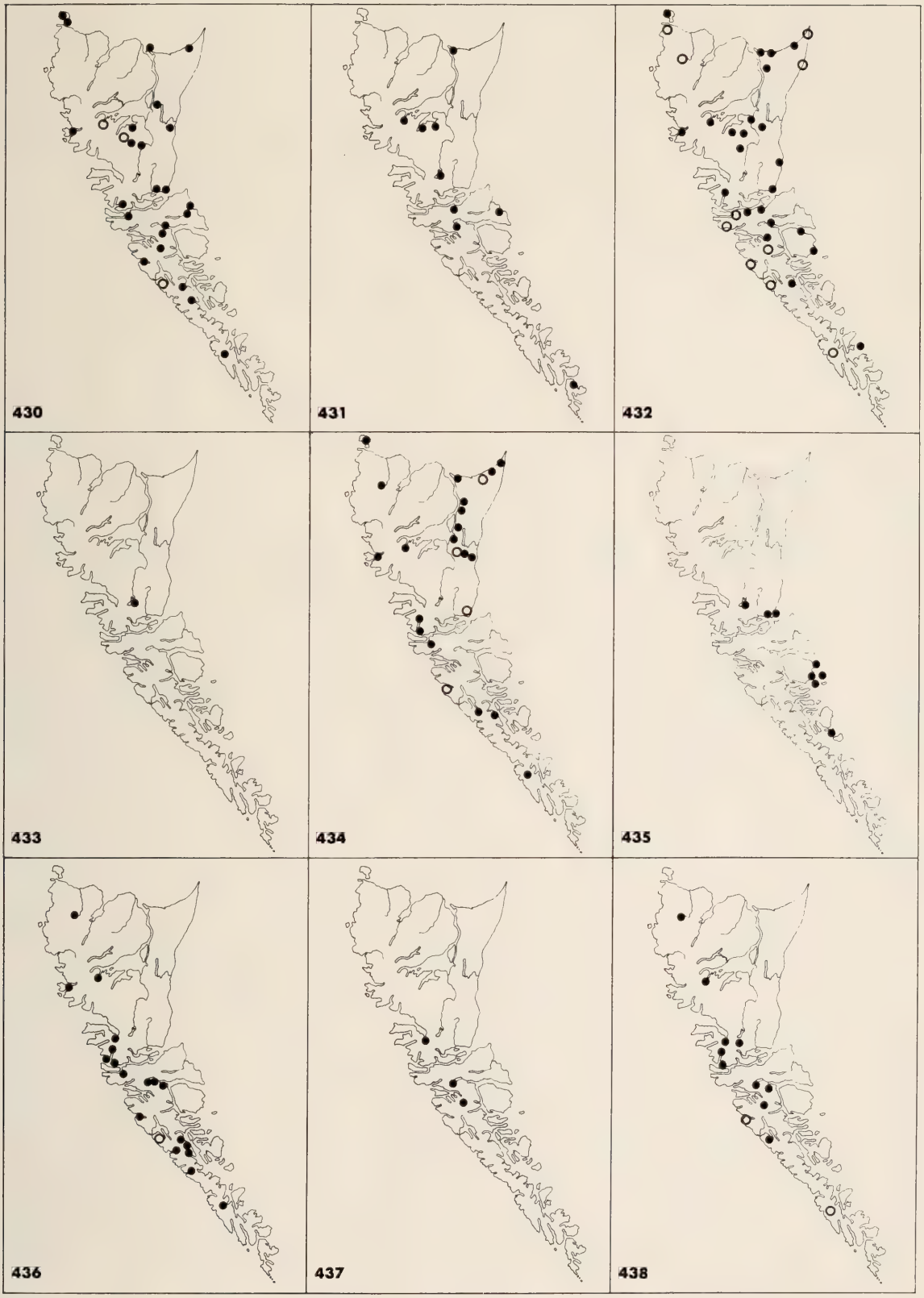
MAPS 404-411. 404. *Viola palustris*. 405a. *Circaea alpina* ssp. *alpina*. 405b. *Circaea alpina* ssp. *pacifica*. 406. *Epilobium anagallidifolium*. 407. *Epilobium angustifolium*. 408. *Epilobium brevistylum*. 409. *Epilobium delicatum*. 410. *Epilobium glandulosum*. 411. *Epilobium latifolium*.



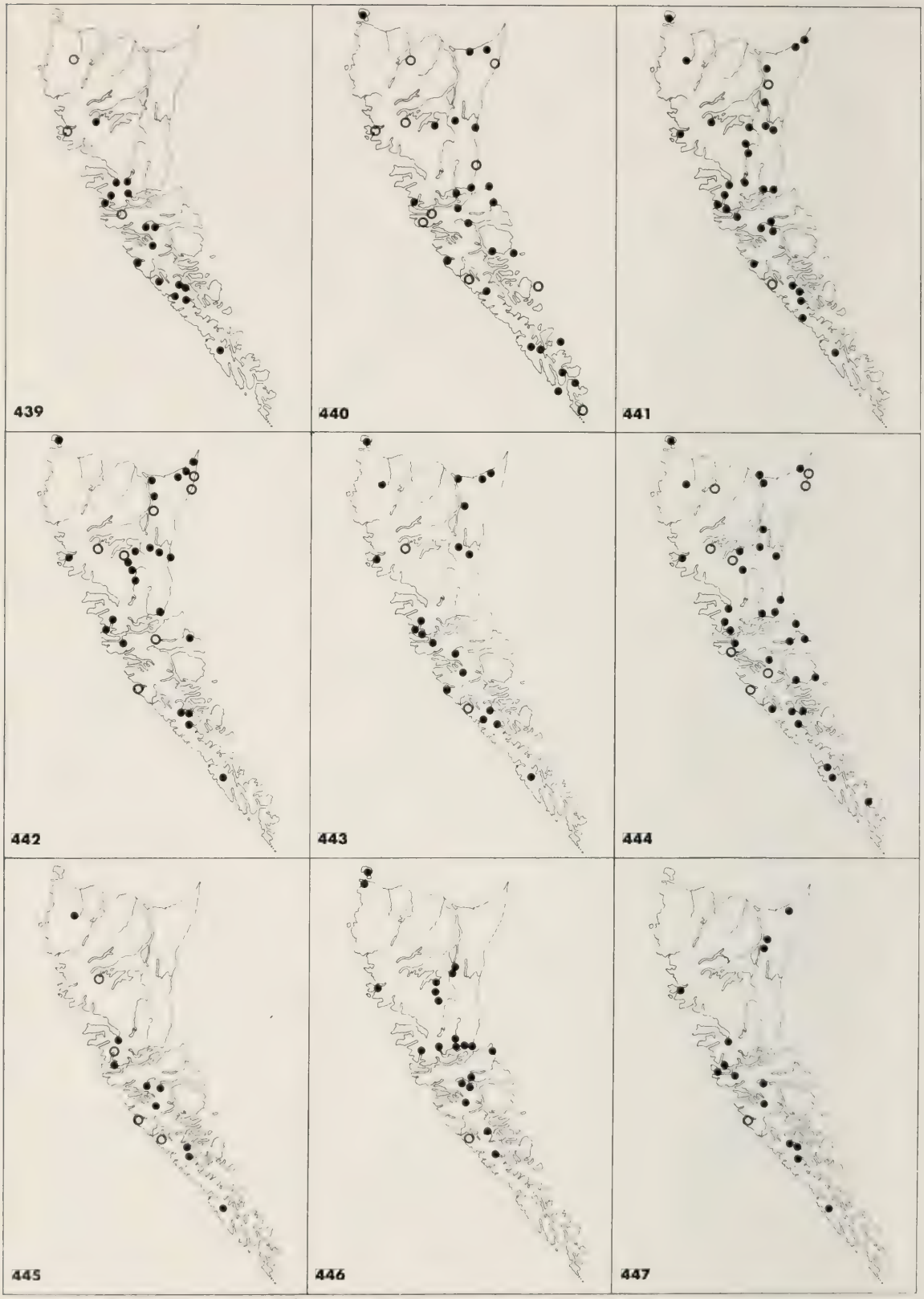
Maps 412-420. 412. *Epilobium minutum*. 413. *Epilobium palustre*. 414. *Myriophyllum spicatum*. 415. *Hippuris montana*. 416. *Hippuris vulgaris*. 417. *Oplopanax horridus*. 418. *Angelica lucida*. 419. *Conioselinum pacificum*. 420. *Glehnia littoralis* ssp. *leiocarpa*.



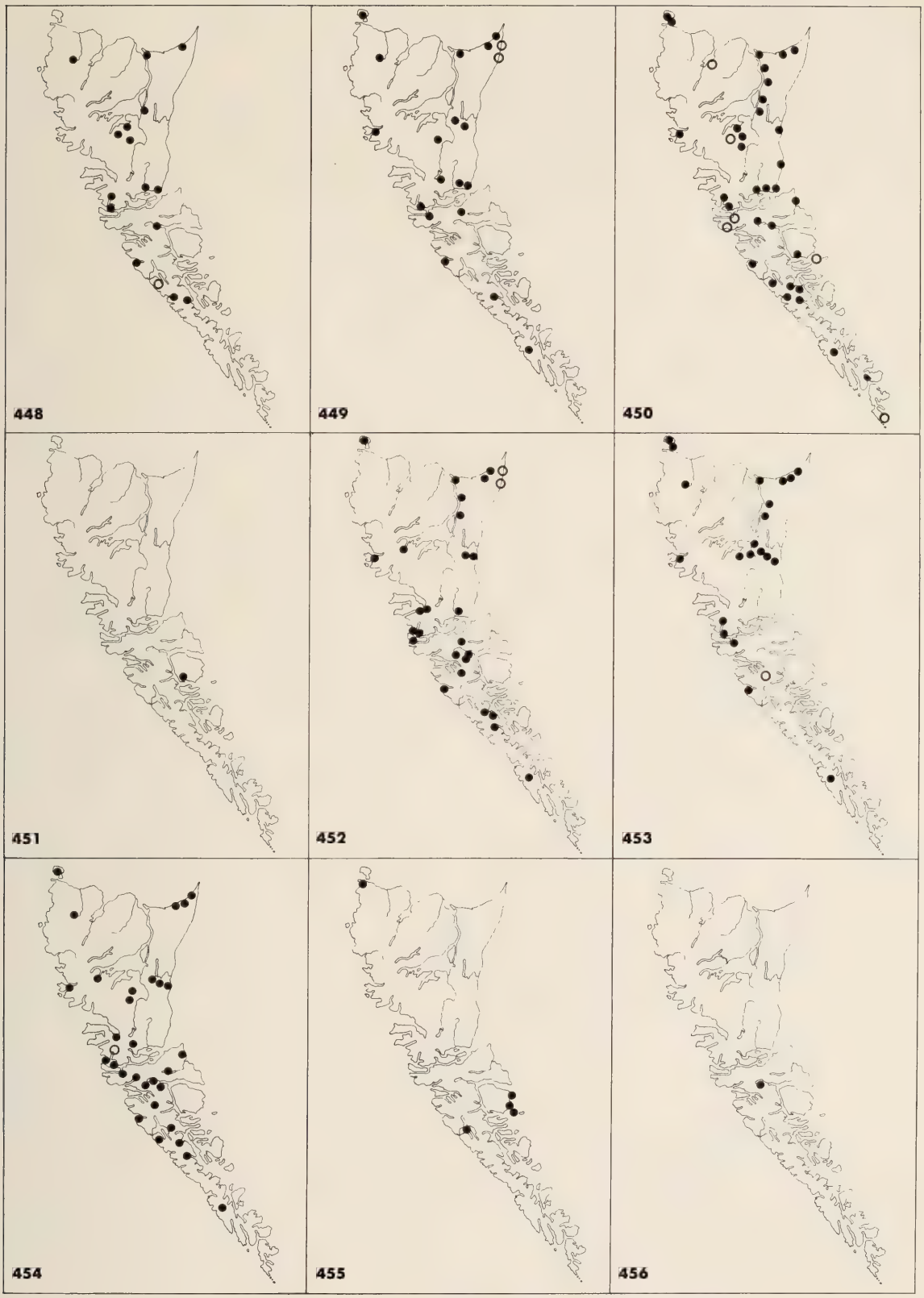
MAPS 421-429. 421. *Heracleum lanatum*. 422. *Ligusticum calderi*. 423. *Ligusticum scoticum* ssp. *hultenii*. 424. *Lilaeopsis occidentalis*. 425. *Oenanthe sarmentosa*. 426. *Osmorhiza chilensis*. 427. *Osmorhiza purpurea*. 428. *Sanicula crassicaulis*. 429. *Cornus stolonifera*.



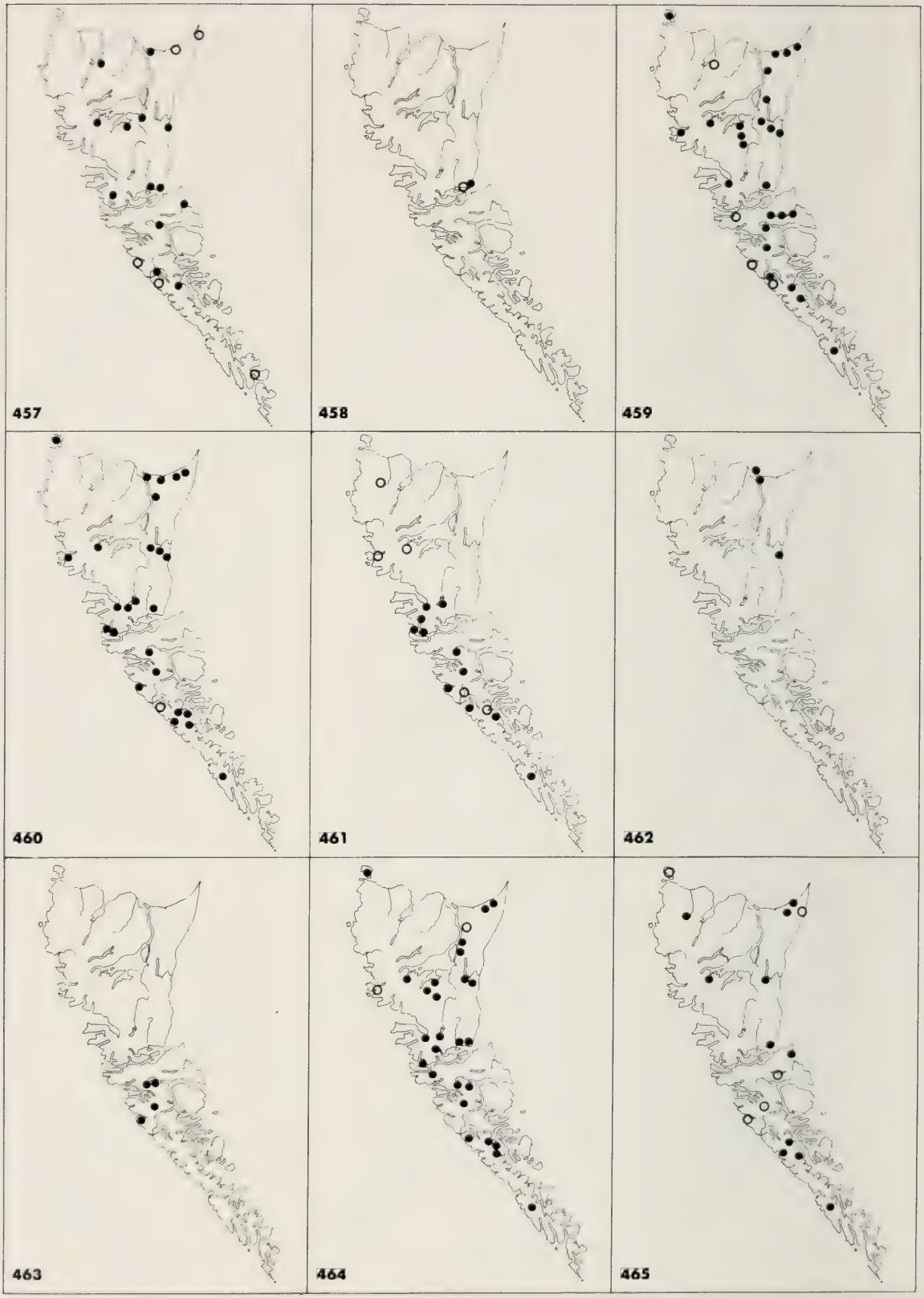
Maps 430-438. 430. *Cornus unalaschkensis*. 431. *Hypopitys monotropa*. 432. *Moneses uniflora* ssp. *reticulata*. 433. *Pyrola secunda*. 434. *Andromeda polifolia*. 435. *Arctostaphylos uva-ursi*. 436. *Cassiope lycopodioides* ssp. *cristapilosa*. 437. *Cassiope mertensiana*. 438. *Cassiope stelleriana*.



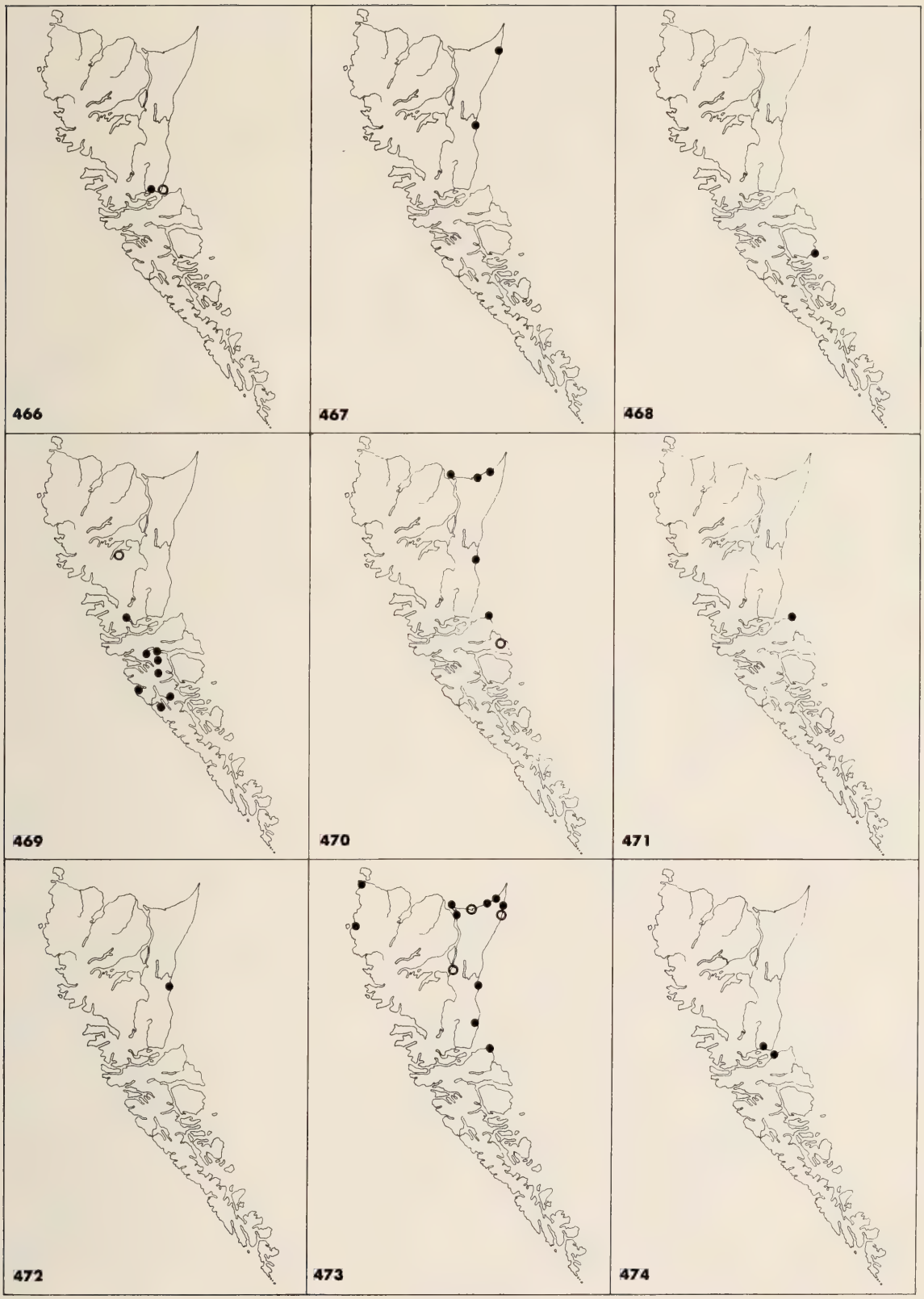
MAPS 439-447. 439. *Cladothamnus pyrolaeflorus*. 440. *Gaultheria shallon*. 441. *Kalmia polifolia*. 442. *Ledum palustre* ssp. *groenlandicum*. 443. *Loiseleuria procumbens*. 444. *Menziesia ferruginea*. 445. *Phyllodoce glanduliflora*. 446. *Vaccinium alaskense*. 447. *Vaccinium caespitosum*.



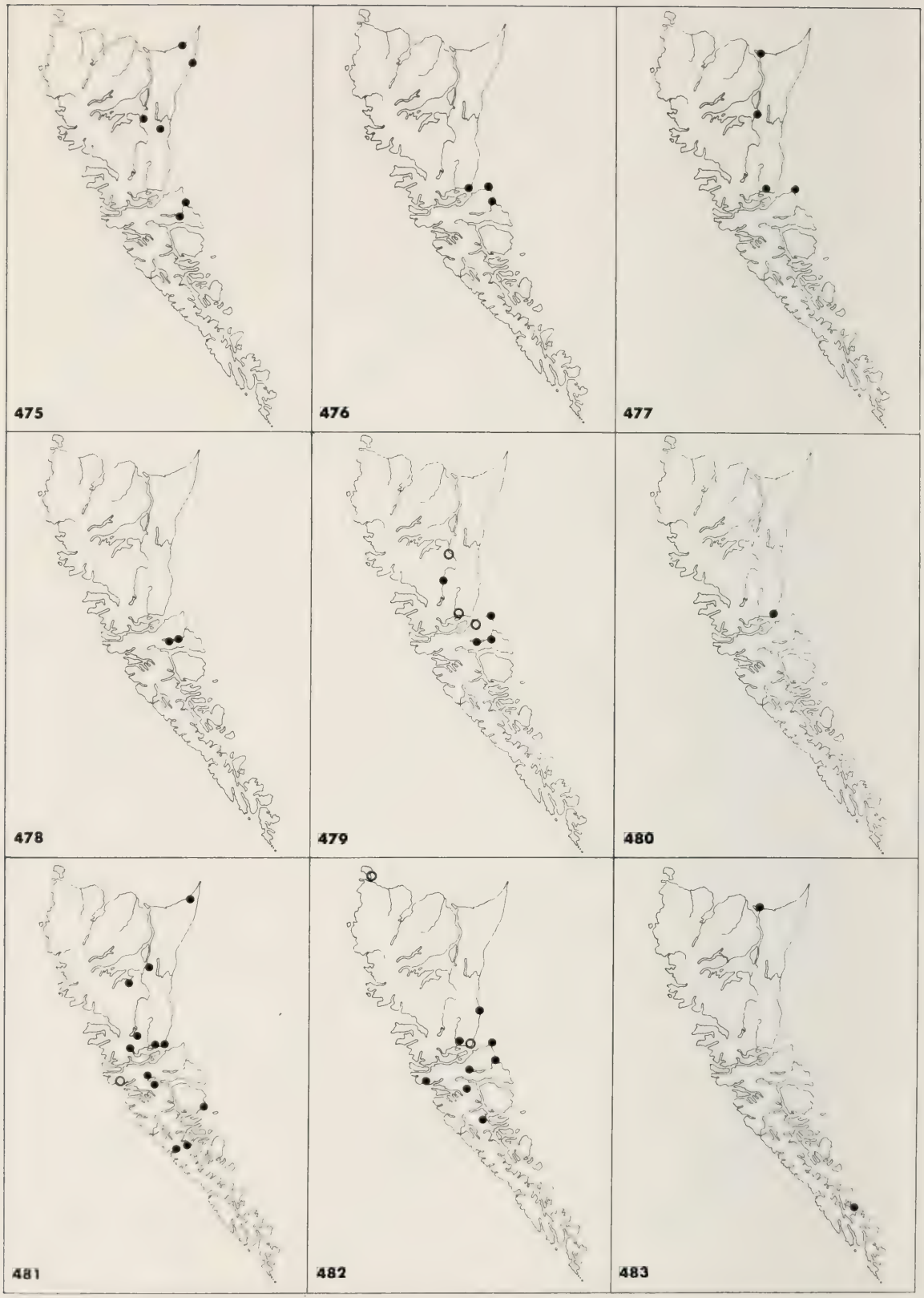
Maps 448-456. 448. *Vaccinium ovalifolium*. 449. *Vaccinium oxycoccus*. 450. *Vaccinium parvifolium*. 451. *Vaccinium scoparium*. 452. *Vaccinium uliginosum*. 453. *Vaccinium vitis-idaea* ssp. *minus*. 454. *Dodecatheon jeffreyi*. 455. *Dodecatheon pulchellum*. 456. *Douglasia laevigata* ssp. *ciliolata*.



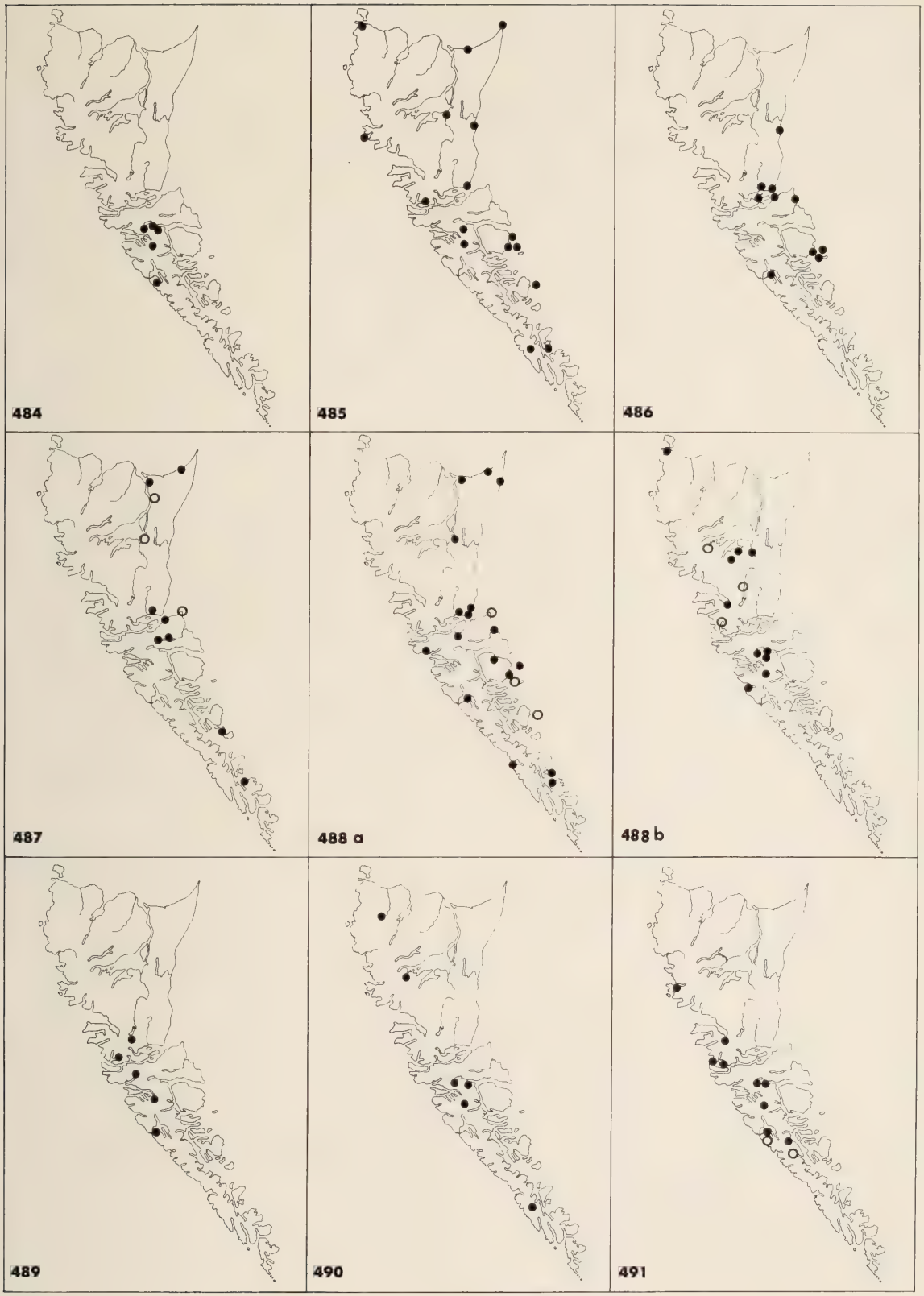
MAPS 457-465. 457. *Glaux maritima* ssp. *obtusifolia*. 458. *Lysimachia punctata*. 459. *Trientalis europaea*. 460. *Gentiana douglasiana*. 461. *Gentiana platypetala*. 462. *Gentianella amarella* ssp. *acuta*. 463. *Swertia perennis*. 464. *Fauria crista-galli*. 465. *Menyanthes trifoliata*.



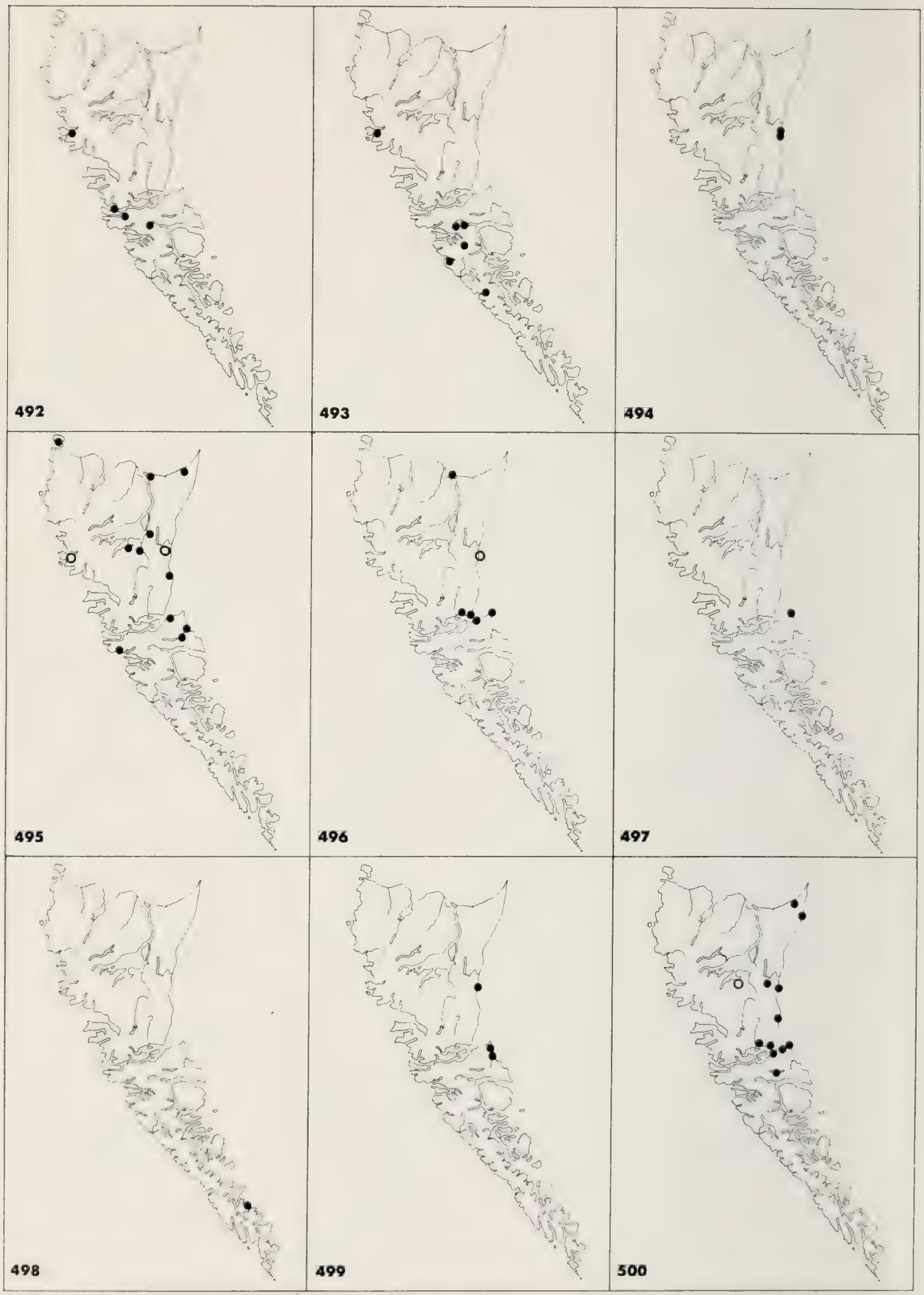
MAPS 466-474. 466. *Convolvulus sepium*. 467. *Convolvulus soldanella*. 468. *Polemonium pulcherrimum*. 469. *Romanzoffia sitchensis*. 470. *Amsinckia spectabilis*. 471. *Lappula echinata*. 472. *Lithospermum officinale*. 473. *Mertensia maritima*. 474. *Myosotis arvensis*.



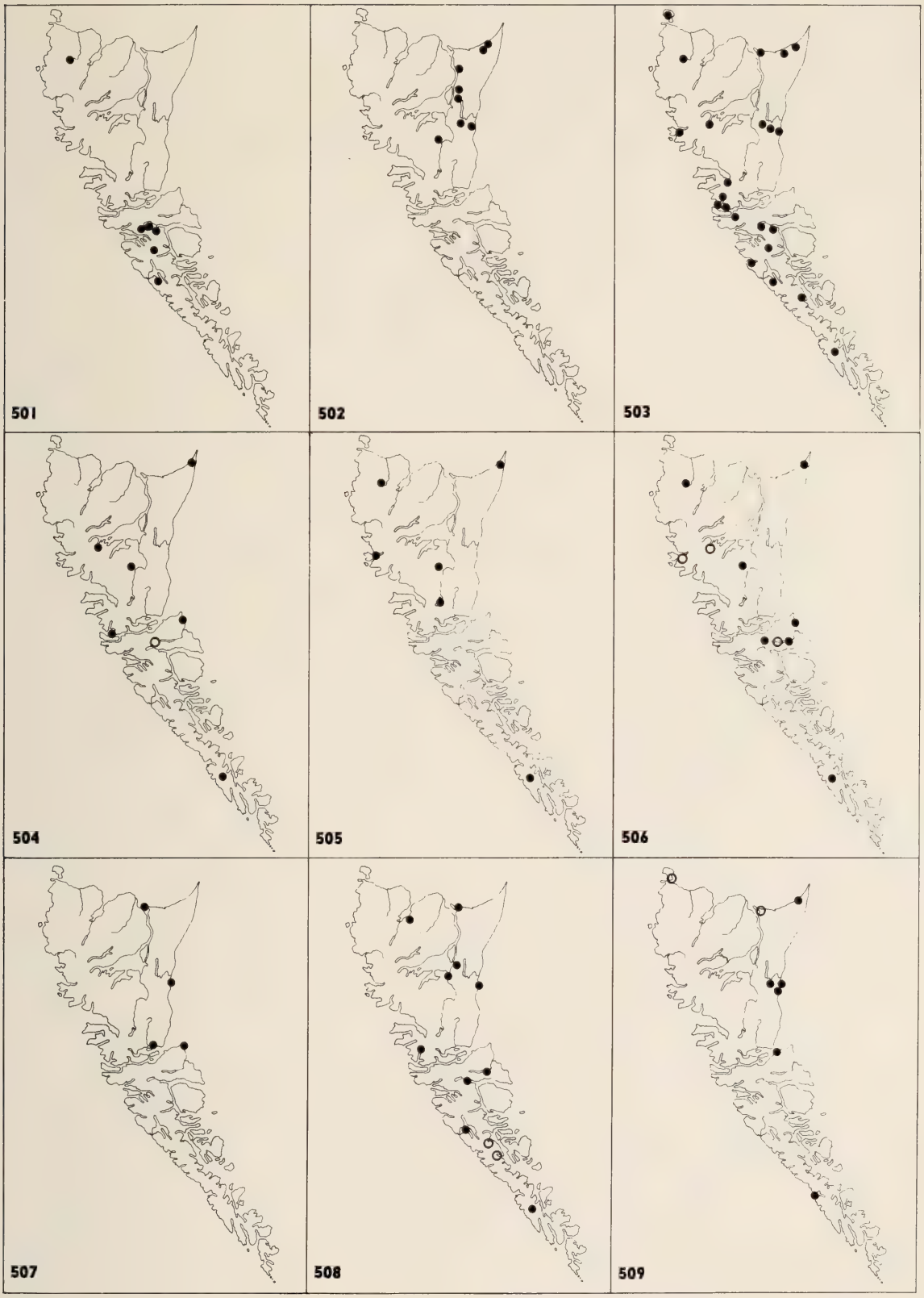
MAPS 475-483. 475. *Myosotis laxa*. 476. *Myosotis scorpioides*. 477. *Galeopsis tetrahit*. 478. *Lycopus uniflorus*. 479. *Mentha arvensis*. 480. *Mentha citrata*. 481. *Prunella vulgaris*. 482. *Stachys cooleyae*. 483. *Castilleja hyetophila*.



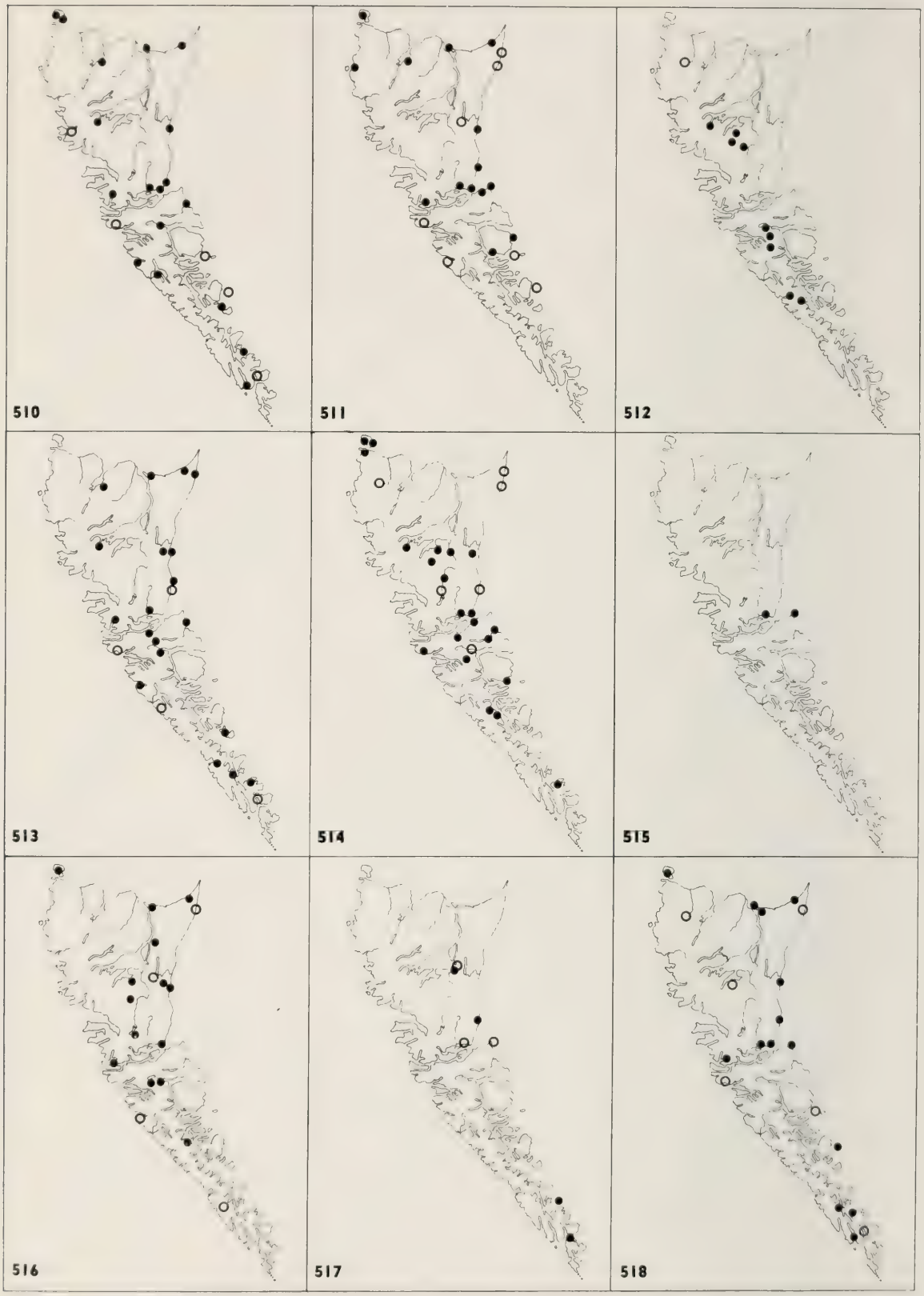
Maps 484-491. 484. *Castilleja parviflora*. 485. *Castilleja unalaschensis*. 486. *Collinsia parviflora*. 487. *Digitalis purpurea*. 488a. *Mimulus guttatus* ssp. *guttatus*. 488b. *Mimulus guttatus* ssp. *haidensis*. 489. *Pedicularis lanata*. 490. *Pedicularis oederi*. 491. *Pedicularis ornithorhyncha*.



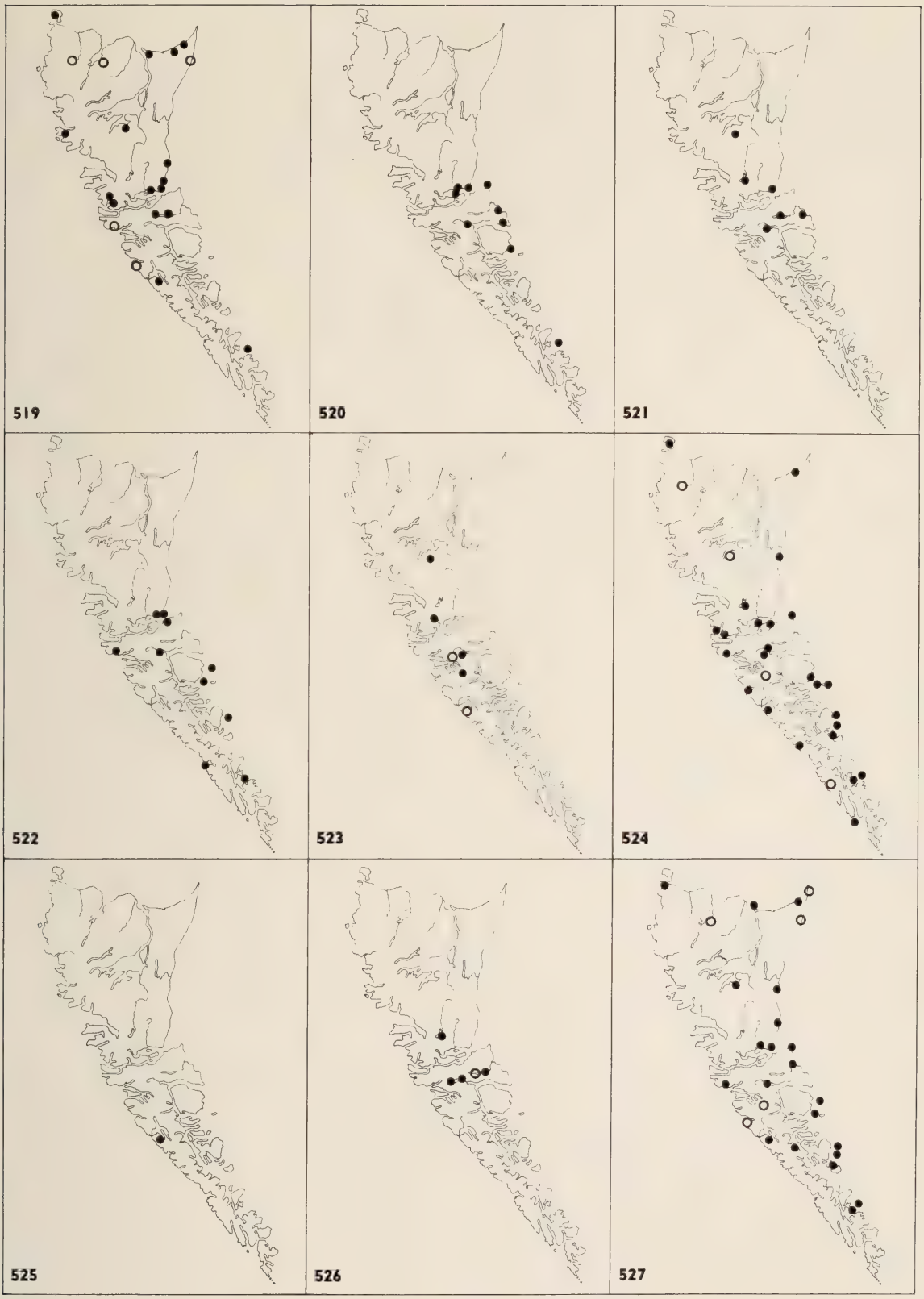
MAPS 492-500. 492. *Pedicularis pennellii* ssp. *insularis*. 493. *Pedicularis verticillata*. 494. *Rhinanthus crista-galli*. 495. *Veronica americana*. 496. *Veronica arvensis*. 497. *Veronica filiformis*. 498. *Veronica peregrina* ssp. *xalapensis*. 499. *Veronica scutellata*. 500. *Veronica serpyllifolia*.



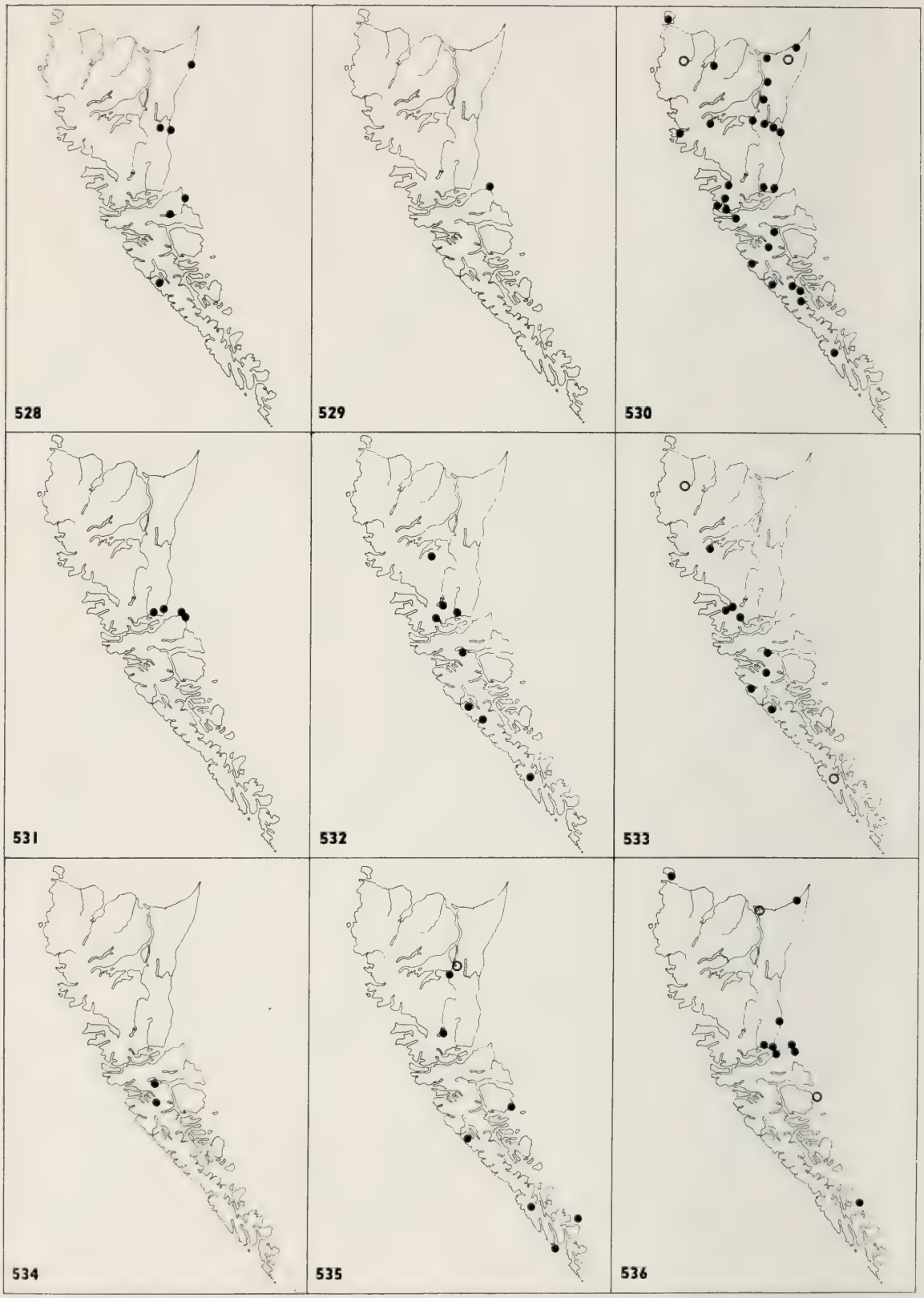
Maps 501-509. 501. *Veronica wormskjoldii*. 502. *Pinguicula villosa*. 503. *Pinguicula vulgaris* ssp. *macroceras*. 504. *Utricularia intermedia*. 505. *Utricularia minor*. 506. *Utricularia vulgaris*. 507. *Plantago lanceolata*. 508. *Plantago macrocarpa*. 509. *Plantago major*.



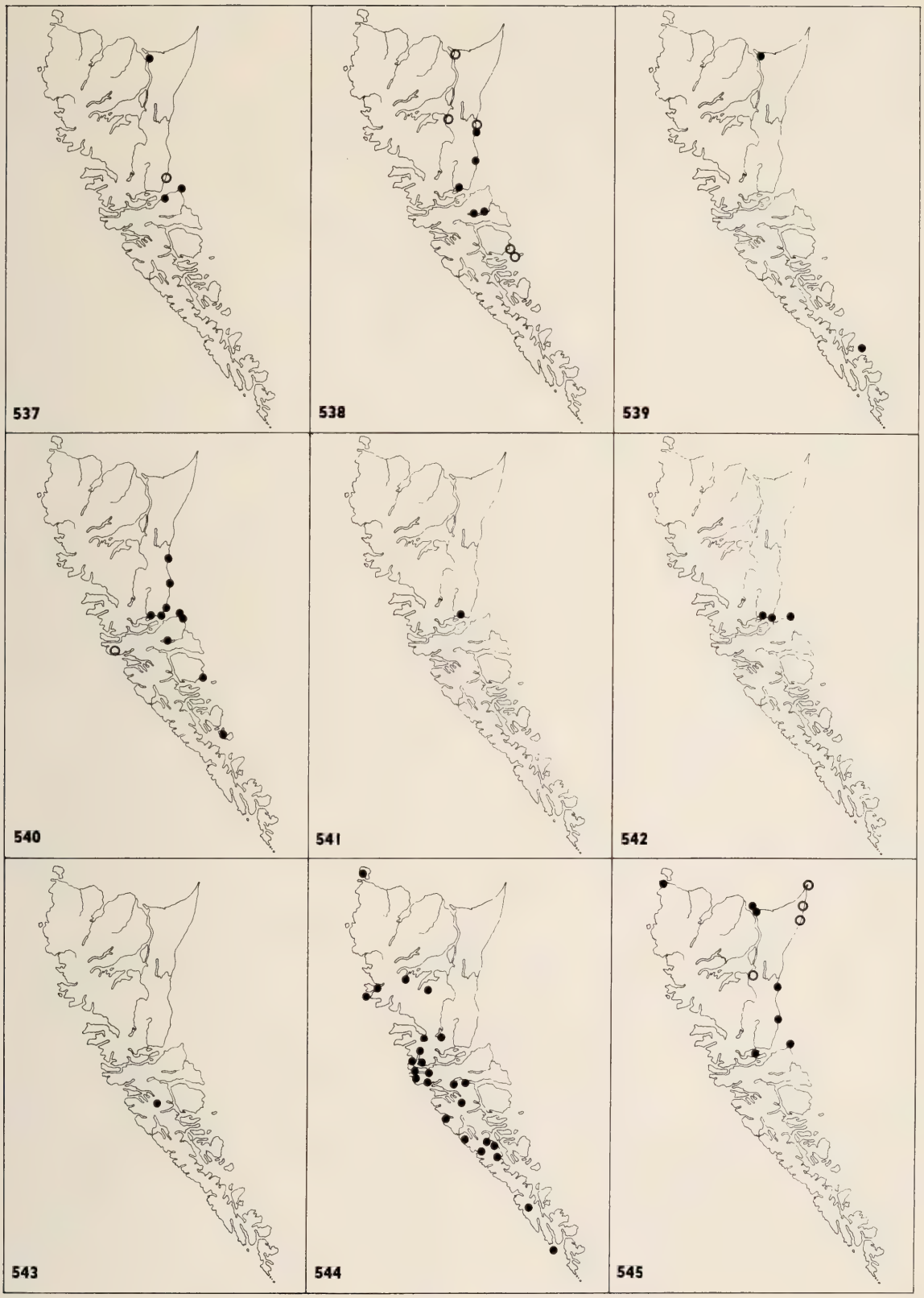
Maps 510-518. 510. *Plantago maritima*. 511. *Galium aparine*. 512. *Galium kamtschaticum*. 513. *Galium trifidum*. 514. *Galium triflorum*. 515. *Sherardia arvensis*. 516. *Linnaea borealis* ssp. *longiflora*. 517. *Lonicera etrusca*. 518. *Lonicera involucrata*.



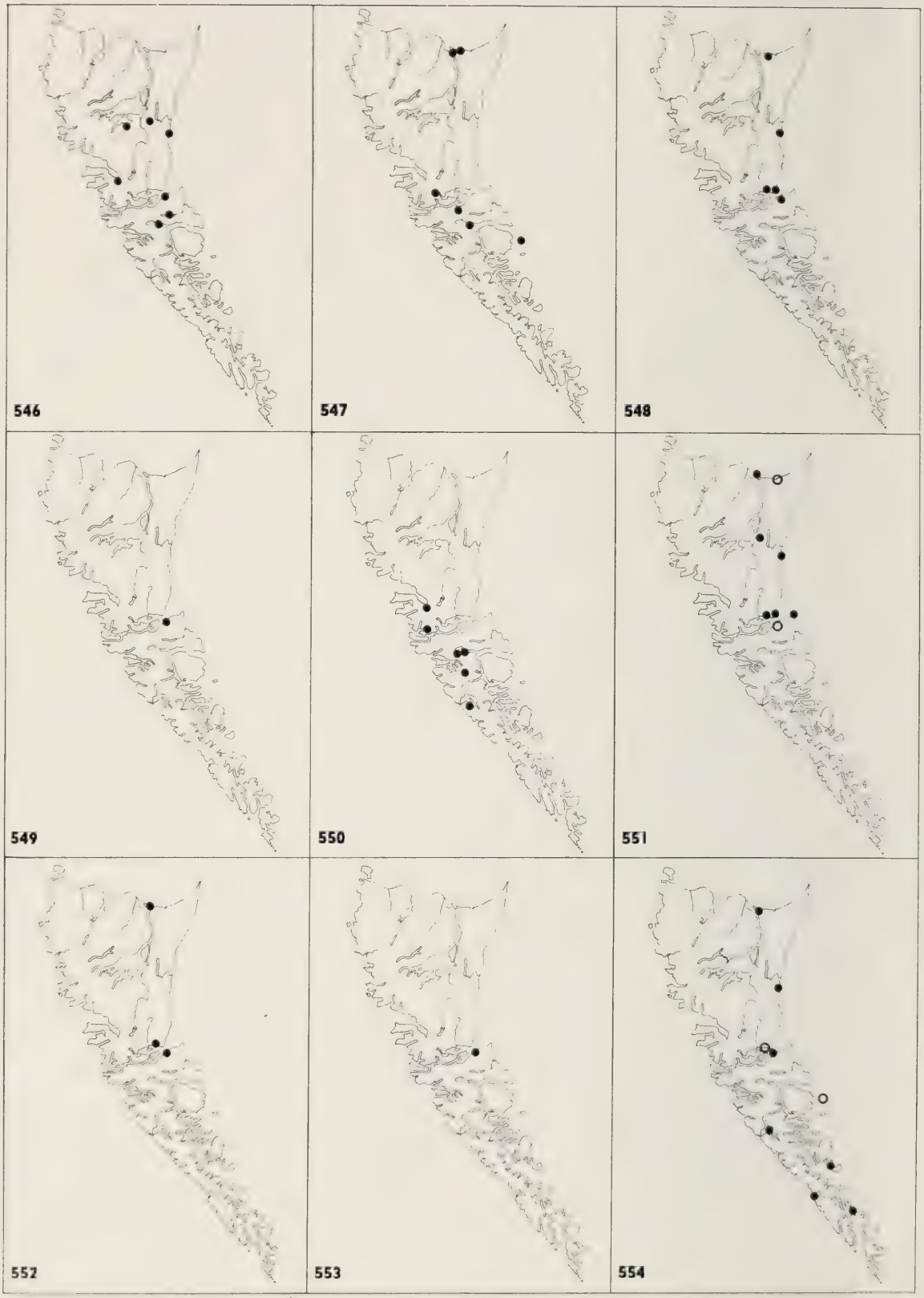
MAPS 519-527. 519. *Sambucus racemosa* ssp. *pubens*. 520. *Symphoricarpos albus*. 521. *Viburnum edule*. 522. *Plectritis congesta*. 523. *Valeriana sitchensis*. 524. *Campanula alaskana*. 525. *Campanula lasiocarpa*. 526. *Lobelia dortmanna*. 527. *Achillea millefolium*.



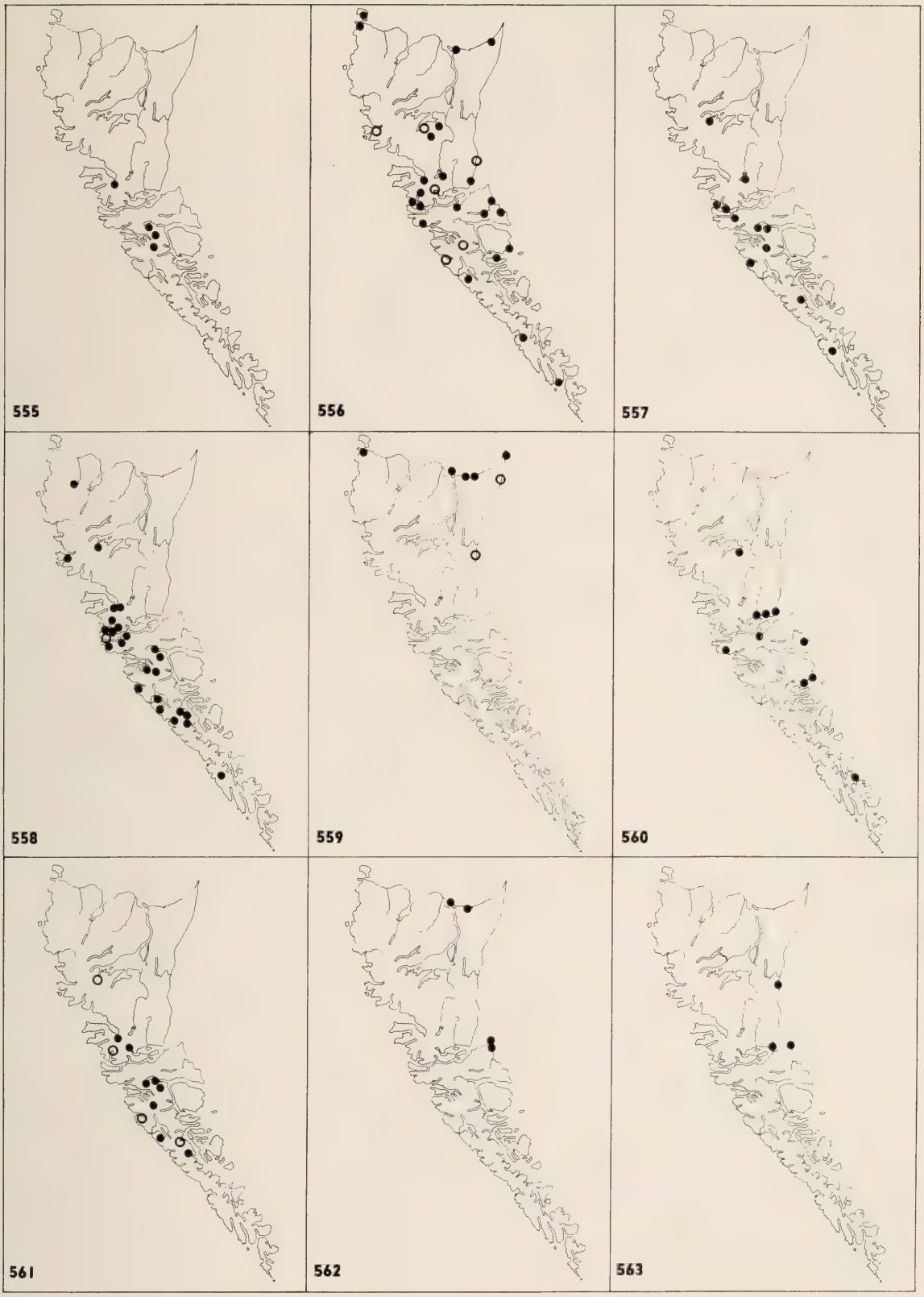
MAPS 528-536. 528. *Anaphalis margaritacea.* 529. *Anthemis cotula.* 530. *Apargidium boreale.* 531. *Arctium minus.* 532. *Arnica amplexicaulis.* 533. *Arnica latifolia.* 534. *Artemisia arctica.* 535. *Aster subspicatus.* 536. *Bellis perennis.*



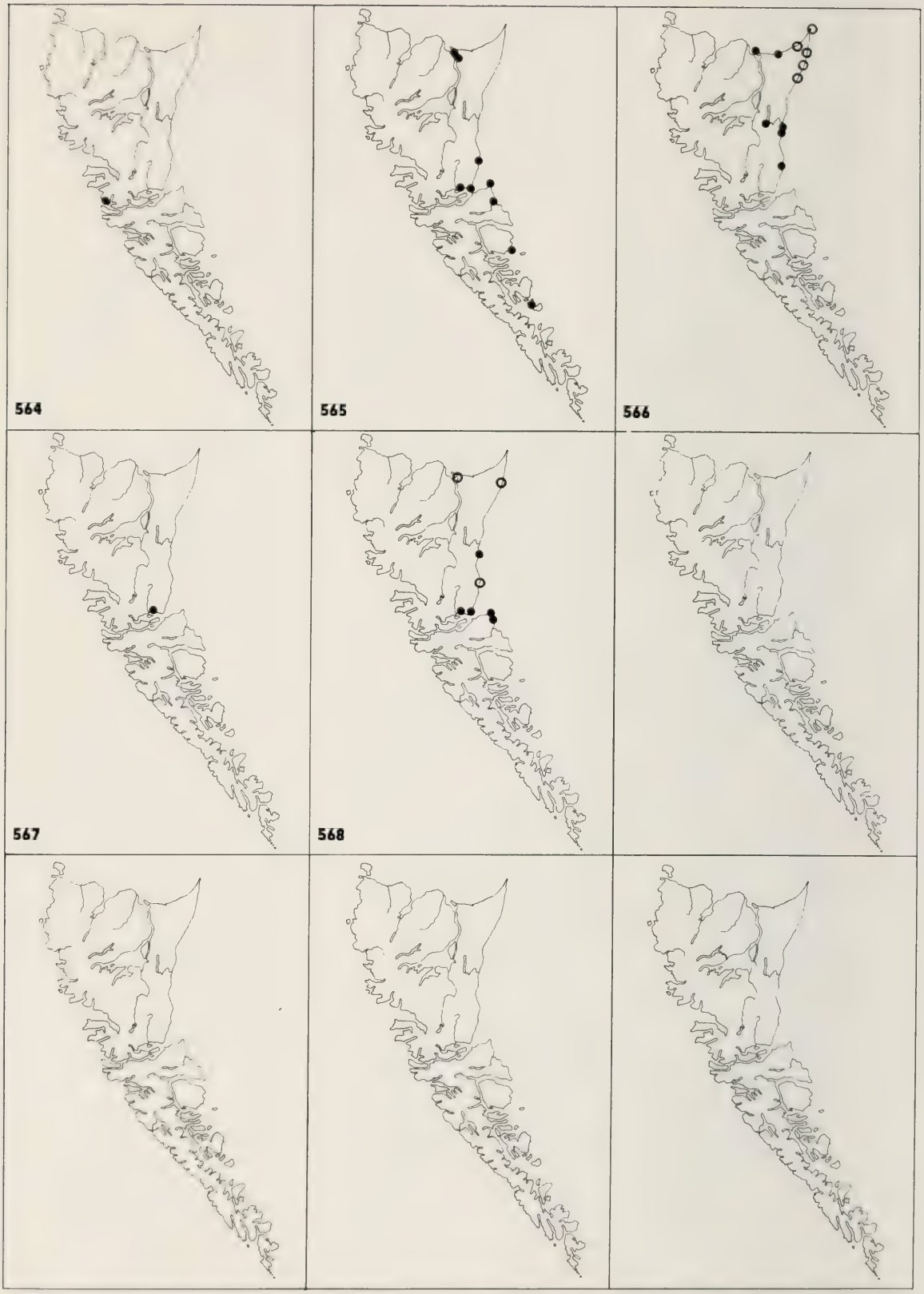
Maps 537-545. 537. *Chrysanthemum leucanthemum.* 538. *Cirsium arvense.* 539. *Cirsium brevistylum.* 540. *Cirsium vulgare.* 541. *Cotula coronopifolia.* 542. *Crepis capillaris.* 543. *Erigeron humilis.* 544. *Erigeron peregrinus.* 545. *Franseria chamissonis.*



MAPS 546-554. 546. *Gnaphalium uliginosum*. 547. *Grindelia integrifolia*. 548. *Hieracium albiflorum*. 549. *Hieracium aurantiacum*. 550. *Hieracium triste*. 551. *Hypochaeris radicata*. 552. *Lapsana communis*. 553. *Leontodon nudicaulis* ssp. *taraxacoides*. 554. *Matricaria matricarioides*.



Maps 555-563. 555. *Petasites nivalis*. 556. *Prenanthes alata*. 557. *Senecio cymbalarioides* ssp. *moresbiensis*. 558. *Senecio newcombei*. 559. *Senecio pseudo-arnica*. 560. *Senecio sylvaticus*. 561. *Senecio triangularis*. 562. *Senecio vulgaris*. 563. *Solidago canadensis*.



MAPS 564-568. 564. *Solidago multiradiata*. 565. *Sonchus asper*. 566. *Tanacetum huronense*. 567. *Tanacetum vulgare*. 568. *Taraxacum officinale*.

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GLOSSARY

abaxial Relating to the side of a lateral organ that faces away from the axis, as the usually lower side of a leaf.

achene A small, dry, indehiscent one-seeded fruit with a tight thin pericarp.

acicular Needle-shaped.

acuminate Tapering to a point.

acute Distinctly and sharply pointed.

adaxial Relating to the side of a lateral organ that faces toward the axis, as the usually upper side of a leaf.

adnate Grown to, or organically united with, another part.

adventive Introduced.

allopatric Of populations or taxa that occupy mutually exclusive geographical areas.

alternate Arranged singly at different positions on an axis.

androecium The aggregate of stamens of a flower.

androgynous Composed of both staminate and pistillate flowers, the staminate at the apex; as in Cyperaceae. See *gynecandrous*.

anisophylly A condition in which different forms of leaves occur on the same stem.

anther The portion of the stamen that contains the pollen, usually bilocular and attached to a filament.

anthesis The time of opening of a flower.

apiculate Furnished with a sharp, short, flexible pointed tip.

arachnoid Cobwebby, with an entanglement of fine whitish hairs.

arcuate Curved or bowed.

areole Open space formed by anastomosing veins; a small pit or cavity on a surface.

aristate Bearing a stiff bristlelike awn or seta.

articulate Jointed, provided with nodes or joints.

asplenioid Resembling the fern genus *Asplenium*.

attenuate Slenderly tapering; gradually becoming very narrow and slender.

auricle An ear-shaped part or appendage occurring as a projection at the base of some leaves and petals.

awn A bristle-shaped appendage.

axillary In the angle formed between any two organs, as a leaf and stem.

banner The uppermost petal of a papilionaceous corolla, the standard or vexillum.

barbellate Having a pappus made up of short, stiff, straight hairs.

berry A pulpy indehiscent few- or many-seeded fruit, the pulpy fruit resulting from a single pistil containing one or more seeds as in the tomato or grape; the term berry-cone has been applied to the juniper in which the cone scales have become fleshy and fused.

biangulate Having two corners or angles.

biennial A plant requiring two years to complete its life cycle, growing only vegetatively the first year, flowering and fruiting and dying the second.

bifid Deeply cleft into two parts.

bipinnate Having both primary and secondary divisions of a leaf pinnate.

bipinnatifid Having the divisions of a pinnatifid leaf pinnatifid.

bituberculate Having two rows of tubercles.

bract A modified leaf subtending a flower or belonging to an inflorescence.

bracteole Bractlet; a secondary bract, as one upon the pedicel of a flower.

bulbil A compound unit consisting of much reduced and modified branching system found in the axils of leaves or bracts that serves to dispense and propagate the plant.

caducous Falling off early or prematurely, as the sepals of some plants.
caespitose Growing in tufts or cushions; forming mats or turf.
calcicole A plant growing on limestone.
calciphile A plant adapted to calcareous soil.
callous grain A hard-textured protuberance of the valve surrounding the achene in a *Rumex*.
callus In grasses, the thickened extension at the base of the lemma, often bearing hairs.
cambium Meristematic tissue that produces secondary phloem and xylem in woody and herbaceous plants.
campanulate Bell-shaped.
canescent Gray-pubescent.
capillary Slender, hairlike.
capitulum A head or cluster of sessile flowers, as in Compositae.
capsule A dry, dehiscent seed vessel.
carinate Keeled.
carpel A simple pistil or the individual element of a compound pistil.
cartilaginous Tough and hard, but flexible.
caryopsis A one-celled, one-seeded, superior fruit, with pericarp united to the seed; the fruit of grasses.
castaneous Of a chestnut-color; dark brown.
catkin A deciduous spike, consisting of unisexual apetalous flowers; an ament.
caudex The persistent base of an annual herbaceous stem.
cauline Pertaining or belonging to the stem.
chartaceous Of a papery or tissuelike texture.
cilia Marginal hairs.
ciliate Fringed with hairs.
ciliolate Minutely ciliate.
circumscissile Opening or dehiscing by a line around the fruit or anther, the valve usually coming off as a lid.
clavate Club-shaped, thickened towards the apex.
clone The aggregate asexually reproduced progeny of an individual.
coma A tuft of hairs.
concolorous Of one color.
connective The portion of the stamen that connects the two locules of an anther.
conspecific Belonging to the same species.
cordate Heart-shaped.
coralloid Coral-like.
coriaceous Leathery.
corolla The inner whorl of the perianth composed of either united or separate petals.
corymb A more or less flat-topped indeterminate inflorescence, the outer flowers opening first.
costa A rib.
cotyledon Primary leaf or leaves in the embryo; seed leaf.
crenate Having the margin cut with rounded teeth, scalloped.
crenulate Finely crenate.
cruciform Cross-shaped.
culm The stem of grasses and sedges.
cuneate Wedge-shaped; triangular with the narrow end at point of attachment.
cuspidate Having an apex somewhat abruptly and sharply concavely constricted into an elongated, sharp-pointed tip.
cyme A more or less flat-topped, determinate inflorescence with the central flowers opening first.

deciduous Falling off at the end of one season of growth.
decumbent Reclining or lying on the ground but with the growing tip ascending.
decurrent Extending down and adnate to the stem, as in some leaf bases.

deltoid Shaped like an equilateral triangle.
dentate Having the margin cut with sharp, rather coarse teeth that are perpendicular to the margin.
denticulate Minutely dentate.
determinate Pertaining to an inflorescence in which the uppermost flowers open first.
dimorphic Occurring in two forms, as in some ferns with separate and distinct fertile and sterile fronds.
dioecious Having staminate and pistillate flowers on separate plants. See *monoecious*.
distal Remote from the place of attachment.
dorsal Abaxial.
drupe A fleshy one-seeded indehiscent fruit with seed enclosed in a stony endocarp; a stone fruit.

ebracteate Without bracts.
ecophenotype A nongenetic modification of the phenotype in response to an environmental condition.
ecotype A local race that owes its most conspicuous characters to the selective effects of local environment.
eligulate Without a ligule.
ellipsoid An elliptic solid.
elliptic Shaped like an ellipse, oblong with regularly rounded ends.
emarginate Having a notch, usually at the apex.
endemic Native or confined naturally to a given region.
epidermis The outermost layer(s) of cells.
equitant Overlapping in two ranks, as in the leaves of *Iris*.
erose Said of a margin that appears eroded or gnawed or with a jaggedness too small to be fringed or too irregular to be toothed.
eusporangiate Said of a fern sporangium that has developed from a group of cells that first divided periclinally to produce inner sporogenous tissue and outer sterile sporangium-forming cells. See *leptosporangiate*.
exstipulate Without stipules.

farinaceous Containing starch or starchlike materials; sometimes applied to a surface covered with a mealy coating, farinose.
fascicle A tight cluster or bundle of flowers, leaves, stems or roots.
ferrugineous Rust-colored.
fibrillose Furnished with fine fibers.
fibrovascular Tissue of mixed vessels and fibers, as in xylem.
filiform Threadlike; long, slender and terete.
filament Stalk of the stamen supporting the anther.
flabellate Fanlike or broadly wedge-shaped.
flaccid Without rigidity, limp, flabby.
floccose Covered with tufts of soft woolly hair that usually rub off easily.
floret An individual flower of the Compositae and Gramineae; a small flower of a dense cluster.
floriferous Flower-bearing.
foliaceous Having the texture or shape of a leaf.
foliate Having leaves.
foliolate Having leaflets.
follicle A dry dehiscent fruit of one carpel, opening by a suture to which the seeds are attached.
friable Fragile, easily crumbled.
frond The leaf of a fern.
fusiform Spindle-shaped, tapering toward both ends.

galea The helmetlike portion of a perianth, as the upper sepal of *Aconitum* and the upper lip of some bilabiate corollas.

galeate Helmet-shaped; having a galea.

gametophyte The generation that bears the sexual organs; in ferns a thalluslike, minute or small body bearing archeogonia and antheridia.

gamopetalous With a corolla of united petals.

geniculate Bent abruptly so as to resemble a knee-joint.

gibbous Protuberant or swollen on one side, usually basally, as in a snapdragon corolla.

glabrous Without hairs.

glaucous Covered with a bloom or whitish substance.

glomerate In dense or compact cluster or clusters.

glomerule A cluster of capitula.

glume A small chafflike bract; specifically one of the two empty chaffy bracts at the base of most grass spikelets.

grain The caryopsis or fruit of a grass; the tubercle-like structures or processes that occur on the valves of *Rumex*.

gynecandrous Having staminate and pistillate flowers in the same spike, the pistillate at the apex; used chiefly in the Cyperaceae. See *androgynous*.

hastate Having the shape of an arrowhead, but with the basal lobes pointed or narrow and standing nearly or quite at right angles.

herbaceous Not woody; dying down each year.

hermaphrodite Bisexual, having stamens and carpels in the same flower.

heterosporous Producing two kinds of spores, as in *Isoetes* and *Selaginella*.

hirsute Pubescent with rather coarse and stiff hairs.

hirsutulous Slightly hirsute.

hirtellous Minutely hirsute.

hispid Provided with rigid or bristly hairs.

homosporous Producing one kind of spore as in *Equisetum*, *Lycopodium* and most ferns.

hyaline Transparent or translucent and colorless.

hydathode A waterpore or watergland usually found at the tip or along the margin of a leaf.

hypanthium The cuplike receptacle usually derived from the fusion of floral envelopes and androecium, and on which are borne the calyx, corolla, and androecium.

hypsithermal The time during the Postglacial period when mean annual temperatures were higher than those at present.

imbricate Overlapping.

incised Sharply cut or notched.

indehiscent Not opening, as of fruits that remain closed at maturity.

indeterminate Pertaining to inflorescences in which the lowermost flowers open first.

indigenous Native to the region, not introduced.

indusium An epidermal outgrowth covering the sorus in ferns.

infraspecific Referring to any unit of classification below the species level.

infrastipular Borne below the stipules, as in a prickle.

intercostal Between the ribs or veins of a leaf.

internode The space or portion of a stem between two nodes.

introgression The incorporation of genes of one species into the gene pool of another species.

introrse Turned inward, as an anther whose line of dehiscence faces towards the center of the flower.

involucrate Having an involucre.

involucre A single or multiple ring of bracts surrounding several flowers or their supporting axes, as in Compositae or Umbelliferae.

involute Rolled inward or toward the upper or adaxial surface.

irregular Of a corolla, lacking radial symmetry; capable of bisection in only one plane; zygomorphic.

keel The two lower united petals of a papilionaceous corolla.

lacerate Irregularly cleft or torn.
laciniate Slashed; cut into narrow pointed lobes.
lacuna A hole or cavity.
lanate Woolly, with long intertwined and curly hairs.
lanceolate Lance-shaped, much longer than broad, tapering towards both ends from below the middle.
leaflet Secondary leaf; one part of a compound leaf.
lectotype A specimen chosen as the type of a taxon.
lemma In grasses, the lower of the two bracts immediately enclosing the flower.
lenticular Shaped like a doubly convex lens.
leptosporangiate Said of a fern sporangium that is derived from one superficial cell. See *eusporangiate.*
ligulate Furnished with a ligule, applied to strap-shaped flowers in Compositae.
ligule Strap-shaped body, as the limb of the ray florets in Compositae; the thin, scarious projection from the top of the leaf sheath in grasses; the narrow, membranous, acuminate structure on the adaxial surface of the leaf base in *Isoetes* and *Selaginella.*
lingulate Tongue-shaped.
lyrate Lyre-shaped, pinnatifid with the terminal lobe large and rounded, the lower lobes small.

mammiform Breast-shaped, conical with rounded apex.
megaspore The larger of two spore sizes produced by *Selaginella* and *Isoetes;* the spore that on germination gives rise to the female gametophyte.
membranous Thin and semitransparent; of parchmentlike texture.
mentum In some orchids, an extension of the foot of the column and a projection in front of the flower.
mericarp A portion of a fruit that splits away as a perfect fruit; as the two carpels in Umbelliferae.
mesophyll The interior parenchyma of a leaf.
monocephalous Bearing a single flowering head.
monoecious Having staminate and pistillate flowers on the same plant. See *dioecious.*
mucronate Terminated abruptly by a distinct short and sharp spur or spiny tip.

nut An indehiscent, one-seeded, hard and bony fruit derived from a simple or compound ovary.
nutlet A small or diminutive nut.

oblanceolate Tapering to both ends from above the middle.
ochrea A nodal sheath formed by the fusion of two stipules, as in Polygonaceae.
ochroleucous Yellowish white, buff.
opposite Situated in pairs on an axis, as leaves when two at one node; the one part before another, as a stamen in front of a petal.
orbicular Flattened with a circular outline.
ovary The ovule-bearing portion of a carpel.
ovoid Egg-shaped.

palea A chaffy scale on the receptacle of Compositae; in grasses, the upper or inner of the two bracts immediately enclosing the flower.
palmate Lobed, divided, or ribbed in a palmlike or handlike manner.
paludal Pertaining to marshes or regions that are wet throughout the year.
panicle A compound racemose inflorescence.
papillae Minute nipple-shaped protuberances.
pappus Modified outer perianth of Compositae; plumose, bristlelike, or scalelike.
paraphysis A sterile filament that may occur among sporangia in a sorus of a fern.

parenchyma More or less isodiametric cells with unthickened walls.
pedate Palmately divided or parted, with the lateral divisions two-cleft.
pedicel The ultimate support of a single flower.
peduncle Stalk of a flower cluster, or of a solitary flower when that flower is the remaining member of a reduced inflorescence.
peltate Shield-shaped and attached to its stalk inside the margin.
perfect Referring to flowers that have functional carpels and stamens.
perianth A collective term for the calyx and corolla.
perigonium The floral envelope surrounding the reproductive organs.
perigynium The inflated flask or papery sheath that envelopes the achene in *Carex*.
petaloid Petal-like.
phenotype The totality of characteristics or appearance of an individual as a result of the interaction between genotype and environment.
phyllode A petiole having the form and function of a leaf.
pilose Shaggy with soft hairs.
pinna A primary division or leaflet of a pinnate leaf.
pinnate Compound, with leaflets or pinnae arranged on either side of a common axis in a featherlike manner.
pinnatifid Pinnately cleft into narrow lobes not reaching to the midrib.
pinnule A secondary pinna or leaflet in a pinnately compound leaf.
pistillate Having carpels but no functional stamens; female.
plumose Featherlike with fine hairs, as in the pappus of Compositae or the coma of some seeds.
polygamodioecious Said of a species that is functionally dioecious but has a few flowers of the opposite sex or a few bisexual flowers on all plants at flowering time.
polygamous With bisexual or hermaphrodite and unisexual flowers on the same plant or on separate individuals of the same species.
polymorphic Of several forms, as a species of many closely related infraspecific taxa.
polypetalous With a corolla of separate petals.
prickle A small and somewhat slender sharp outgrowth from the epidermis.
procumbent Trailing or lying on the ground but without rooting at the nodes.
prostrate Lying flat upon the ground.
pseudolateral Appearing lateral in position.
puberulent Minutely pubescent.
pubescent Covered with short soft hairs; downy.
pungent Terminating in a rigid sharp point.

quasipalmate Appearing as though palmate.

raceme A simple, elongated, indeterminate inflorescence with pedicelled or stalked flowers.
rachilla A diminutive or secondary axis or rachis; in particular, in the grasses and sedges the axis that bears the florets.
rachis Axis bearing flowers or leaflets.
radiate Spreading from or arranged around a common center; in Compositae, a flower head bearing ray flowers.
ramet An individual member of a clone.
ray flower Floret of Compositae with an extended or straplike part to the corolla.
receptacle The more or less enlarged or elongated end of the stem or flower axis on which some or all of the floral parts are borne.
regular Applied to a flower that has the parts in each series or whorl so arranged as to be vertically divisible into equal halves by two or more planes.
reniform Kidney-shaped.
reticulate Netted.
retrorse Directed backward or downward.
retuse With a shallow notch at a rounded apex.
revolute Rolled backward, with margin rolled toward abaxial surface.

rhizoma The corolloid holdfast structure of *Phyllospadix*.
rhizome An underground stem.
rotate Wheel-shaped, circular and flat; applied to a gamopetalous corolla with a flat and circular limb at right angles to a short tube.
rufescent Reddish brown.
rugose Wrinkled.
runcinate Coarsely serrate to sharply incised with the teeth pointing towards the base.
runnel A well-defined spring run-off or summer water course usually associated with mountain areas.

saccate Bag-shaped.
sagittate Like an arrowhead, with the basal lobes pointing downward or concavely toward the stalk.
scabrid Somewhat rough.
scabrous Rough to the touch.
scalariform Having transverse markings suggestive of the rungs of a ladder.
scape Leafless peduncle arising from the ground; it may bear scales or bracts but no foliage leaves.
scapose Bearing flowers or inflorescence on a scape.
scarious Thin, dry, and membranous, not green, often more or less translucent.
schizocarp A pericarp that splits into one-seeded portions, mericarps or split fruits. See *mericarp*.
sclerenchyma A general term applied to thick-walled cells that have usually lost their cytoplasm.
scrotiform Pouch-shaped.
septate Partitioned.
sericeous Silky, clothed with close-pressed soft and straight pubescence.
serrate Saw-toothed with teeth pointing forward.
serrulate Minutely serrate.
sessile Not stalked.
setaceous Bristlelike; bearing bristles.
silique In the Cruciferae a specialized long and narrow capsule whose two valves split from the bottom leaving the placentae with a false partition or septum between them.
sinuate Having a deep wavy margin.
sinus The space or recess between two lobes or divisions of a leaf or other expanded organ.
sorus A cluster of sporangia in ferns.
spadix A spike on a succulent axis enveloped in a spathe.
spathe A large bract enclosing a flower cluster or spadix.
spatulate Oblong with the basal end attenuated like a spatula; spoon-shaped.
spicate Spike-like.
spiciform Having the shape of a spike.
spike An indeterminate inflorescence with sessile flowers on a common elongated axis.
spine A sharp-pointed woody or hardened structure, usually a branch but sometimes a petiole, stipule, or leaf, and always arising from below the epidermis.
spinose Having spines.
spinulose With small spines or spinules.
spore A simple reproductive body, usually composed of a single detached cell; used particularly in reference to the ferns and fern allies.
sporophyll A spore-bearing leaf.
sporophyte A spore-producing plant.
spur A hollow tubular or saclike projection of a petal or sepal, often containing a nectar-secreting gland.

stamen A single unit of the androecium and typically composed of a filament and anther; the pollen-bearing organ of a flowering plant.
staminate Having stamens and no carpels; male.
staminode A sterile stamen or a structure resembling such and borne in the staminal part of the flower.
stellate Star-shaped.
stipe The stalk of a carpel or the petiole of a fern frond.
stipitate Borne on a stipe or short stalk.
stipule A basal appendage on each side of the leaf petiole or at the base of the leaf.
stolon A horizontal stem or runner above the ground that roots at the nodes or at the tip.
stomata A breathing pore apparatus in the epidermis of the leaf.
stramineous Strawlike or straw-colored.
striate Marked with fine longitudinal lines, channels, or ridges.
strigose Having sharp-pointed, appressed, straight and stiff hairs or bristles.
strobilate Pertaining to a strobilus or cone.
strobilus A cone.
strophiole An appendage to the hilum (scar indicating the point of attachment) of some seeds.
stylopodium A disclike enlargement at the base of the style, as in Umbelliferae.
submarginal Near the margin.
subradical Arising from a position immediately above the root.
subsessile Nearly sessile.
subulate Awl-shaped, tapering evenly from base to apex.
succulent Juicy, fleshy, soft and thick.
sympetalous With a corolla of united petals, gamopetalous.
synonymy Other names used for a taxon.
supra-axillary Growing above an axil.
sympatric Of two or more populations occurring in the same area. See *allopatric*.

taproot Primary descending root.
taxon A group of organisms recognized as a formal unit at any level of a hierarchic classification.
tendril A rotating or threadlike process or extension, cauline or foliar, by which a plant secures itself, often found on climbers and vines.
tepal A segment or unit of those perianths not clearly differentiated into typical corolla and calyx.
terete Circular in transverse section, cylindric and usually tapering.
ternate In threes, as in a whorl or cluster.
testa The outer coat of a seed developed from the integument.
tetradydamous Having an androecium of six stamens, four longer than the other two, as in Cruciferae.
tetragonal Four-angled.
tomentose Densely pubescent with matted, soft woolly hairs.
tricephalous Bearing three flowering heads.
trifid Three-cleft.
trifoliate Having three leaves.
trifoliolate Having a leaf or leaves of three leaflets.
trigonous Three-angled, with plane faces.
tristigmatic Having three stigmas.
truncate Appearing as if cut off at the end; the base or apex nearly or quite straight across.
tuber A thickened and short subterranean branch, with buds.
tubercle A small tuberlike prominence or nodule, or warty excrescence; the persistent base of the style in Cyperaceae.
tussock A tuft of grass or grasslike plants.

umbel An indeterminate, often flat-topped inflorescence, in which the pedicels and peduncles arise from a common point like the ribs of an umbrella.
uncinate Hooked.
uniseriate In one row or series.
urceolate Pitcherlike, hollow and contracted at the mouth like an urn or pitcher.
utricle A small bladder; more commonly, a bladdery, one-seeded, usually indehiscent fruit, as in some amaranths.

valve A separable part of a pod; the units into which a capsule splits or divides on dehiscing; a segment of a calyx covering the achene, as in *Rumex*.
ventral Adaxial.
verticillate Whorled.
vesicle A small bladdery sac or cavity filled with air or liquid.
villous Bearing long, weak or shaggy hairs that are not matted.
virgate Wand-shaped, twiggy; long, straight, and slender.
viscid Sticky; glutinous.
viviparous Germinating or sprouting from seed still attached to the parent plant.

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Three typefaces are used:

Boldface—Plant entity found on the Queen Charlotte Islands, page reference to the first page of its systematic treatment, and page reference to an illustration of such a flora entity, the latter reference enclosed in brackets.

Italic—All synonyms and their respective page references.

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THE AUTHORS of this volume have worked together for eleven years on surveys of the flora of British Columbia sponsored by the Canada Department of Agriculture. *James A. Calder*, born in Regina in 1915, and a graduate of Ashbury College, Ottawa, and McGill University, joined the Department in 1946 and retired in 1966. He is an international authority on the flora of the Cordilleran region and has contributed, in particular, to our knowledge of the genera *Carex, Heuchera*, and *Saxifraga*. As a plant collector, he is noted for his abundant and beautifully prepared material and his informative and accurate notes. The Calder collections, consisting of more than 37,000 specimens in the Department of Agriculture Herbarium at Ottawa and over 100,000 duplicates in institutions throughout the world, will undoubtedly become a classical source of information on the botany of the northern half of North America. *Roy L. Taylor* was born in Olds, Alberta, in 1932. He studied at the University of Alberta, Sir George Williams University, McGill, and the University of California at Berkeley, and received his doctorate in botany in 1962. That same year he joined the Plant Research Institute, and in 1965 he became Chief of the Taxonomy Section. He is President of the Canadian Botanical Association, which he helped to found, and he has also been active in developing the Biological Council of Canada. Dr. Taylor is currently studying the evolution of the family Saxifragaceae in North America and he is an editor of the Flora North America Project. For their work on the Queen Charlotte Islands, both authors have had endemic species named after them: *Ligusticum calderi* and *Saxifraga taylori*.